Sunday, December 01, 2013
10:45-12:15 PM • SSA06 • Room: E353A • Gastrointestinal (CT Dose Reduction I)
10:45-12:15 PM • SSA07 • Room: E450A • Gastrointestinal (Rectal Carcinoma Imaging)
10:45-12:15 PM • SSA08 • Room: E450B • Gastrointestinal (Hepatic Fibrosis Imaging)
10:45-12:15 PM • SSA23 • Room: E350 • Gastrointestinal (Embolotherapy/Guidance Technology)
10:45-12:15 PM • SSA24 • Room: E352 • Vascular/Interventional (Portal Interventions/TIPS)
12:30-1:00 PM • LL-GIS-SUA • Room: Lakeside Learning Center • Gastrointestinal - Sunday Posters and Exhibits (12:30pm - 1:00pm)
01:00-1:30 PM • LL-GIS-SUB • Room: Lakeside Learning Center • Gastrointestinal - Sunday Posters and Exhibits (1:00pm - 1:30pm)
02:00-03:00 PM • SSA13 • Room: S402AB • Abdominal Imaging Clinical Pathways (An Interactive Session)
02:00-03:00 PM • RC104 • Room: E353C • Sports Injuries in the Chest and Abdominal Wall: A Core Curriculum of the Body's Core
02:00-03:30 PM • RC109 • Room: E450A • Gastrointestinal: Liver (An Interactive Session)
03:15-04:15 PM • MSR14 • Room: S402AB • Imaging the Bariatric Surgery Patient (An Interactive Session)

Monday, December 02, 2013
08:30-12:00 PM • VSGI21 • Room: N227 • Gastrointestinal Series: Emerging Issues in Abdominal CT
10:30-12:00 PM • SSC05 • Room: E353A • Gastrointestinal (Hepatocellular Carcinoma Imaging)
10:30-12:00 PM • SSC16 • Room: E351 • Gastrointestinal (Oncology: Surveillance and Tumor Response)
10:30-12:00 PM • SSC16 • Room: E351 • Gastrointestinal (Oncology: Surveillance and Tumor Response)
12:15-12:45 PM • LL-GIS-MOA • Room: Lakeside Learning Center • Gastrointestinal - Monday Posters and Exhibits (12:15pm - 12:45pm)
12:45-1:01 PM • LL-GIS-MOB • Room: Lakeside Learning Center • Gastrointestinal - Monday Posters and Exhibits (12:45pm - 1:01pm)
01:30-06:00 PM • VIIO21 • Room: S405AB • Interventional Oncology Series: Hepatocellular Carcinoma
03:00-04:00 PM • SSE07 • Room: E353A • Gastrointestinal (CT Dose Reduction II)
03:00-04:00 PM • SSE08 • Room: E353C • ISP: Gastrointestinal (Oncology: Staging and Distant Metastases)
03:00-04:00 PM • SSE09 • Room: E451A • Gastrointestinal (Cirrhosis and Portal Venous Hypertension)
03:00-04:00 PM • SSE26 • Room: N226 • Gastrointestinal Series: Imaging in the Biliary/ES/GI Interventions
03:30-05:30 PM • MSEM24 • Room: S100AB • Case-based Review of Magnetic Resonance: Abdomen and Pelvis (An Interactive Session)
04:30-06:00 PM • SPDLD2 • Room: E450A • RSNA Diagnosis Live™: Chest and Abdomen

Tuesday, December 03, 2013
08:30-10:00 AM • MSR031 • Room: S103AB • BOOST: Gastrointestinal-Anatomy and Contouring (An Interactive Session)
08:30-10:00 AM • RC312 • Room: E350 • Acute Abdominal Vascular Diseases
08:30-10:00 AM • RC329 • Room: E353B • HCC Diagnosis Using LI-RADS (An Interactive Session)
08:30-10:00 AM • RC351 • Room: E353C • CT/DEXA in the Abdomen and Pelvis: How and When (How-to Workshop) (An Interactive Session)
08:30-12:00 PM • VSGI31 • Room: N230 • Gastrointestinal Series: Pancreas - Inflammation and Neoplasms
10:30-12:00 PM • MSCC22 • Room: S406A • Case-based Review of Nuclear Medicine: PET/CT Workshop - Cancers of the Abdomen and Pelvis (In Conjunction with ...)
10:30-12:00 PM • MSR032 • Room: S103AB • BOOST: Gastrointestinal-Integrated Science and Practice (ISP) Session
10:30-12:00 PM • SSG06 • Room: E350 • Gastrointestinal (Hepatic Steatosis Imaging)
12:15-12:45 PM • LL-GIS-TUA • Room: Lakeside Learning Center • Gastrointestinal - Tuesday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • LL-GIS-TUB • Room: Lakeside Learning Center • Gastrointestinal - Tuesday Posters and Exhibits (12:45pm - 1:15pm)
03:00-04:15 PM • VIIO31 • Room: S103AB • Gastrointestinal-Case-based Review (An Interactive Session)
03:00-04:00 PM • SSJ08 • Room: E353A • Gastrointestinal (Dual Energy CT Imaging)
03:00-04:00 PM • SSJ09 • Room: E353C • Gastrointestinal (Pancreas Focal Lesions and Carcinoma)
03:00-04:00 PM • SSJ10 • Room: E450B • Gastrointestinal (Stomach)
03:00-06:00 PM • VIIO40 • Room: S102AB • Pediatric Radiology Series: Advanced Pediatric Abdominal Imaging
03:30-05:00 PM • MSEM34 • Room: S100AB • Essentials of Trauma Imaging
04:30-06:00 PM • RC409 • Room: E350 • Gastrointestinal: Tumor Response Assessment
04:30-06:00 PM • RC411 • Room: S505AB • Improving PET Interpretation: Present Updates in GI and GYN Cancers with Case Examples (An Interactive Session)
04:30-06:00 PM • RC417 • Room: S504CD • Quantitative CT and MR Perfusion Imaging
04:30-06:00 PM • RC451 • Room: E261 • Imaging in Practice: DWI in the Abdomen and Pelvis (How-to Workshop)

Wednesday, December 04, 2013
08:30-10:00 AM • RC509 • Room: E450B • Gastrointestinal: Abdominal Masses (An Interactive Session)
08:30-10:00 AM • RC529 • Room: N230 • Abdominal MRA Update
08:30-10:00 AM • RC530 • Room: E350 • Abdominal/MRA (CT Colonography)
10:30-12:00 PM • SSK06 • Room: E350 • Gastrointestinal (Focal Liver Lesions and Metastases)
10:30-12:00 PM • SSK07 • Room: E353B • Gastrointestinal (Pancreas Benign Disease)
10:30-12:00 PM • RC522 • Room: S103A • Abdominal Imaging (Intravenous Contrast)
12:15-12:45 PM • LL-GIS-WEA • Room: Lakeside Learning Center • Gastrointestinal - Wednesday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • LL-GIS-WEB • Room: Lakeside Learning Center • Gastrointestinal - Wednesday Posters and Exhibits (12:45pm - 1:15pm)
01:30-03:00 PM • MSCU41 • Room: S406A • Case-based Review of US (An Interactive Session)
03:00-04:00 PM • SSM06 • Room: E353A • Gastrointestinal (CT Technique: Intravenous Contrast)
03:00-04:00 PM • SSM07 • Room: E353B • Gastrointestinal (Endoscopy)
03:00-04:00 PM • SSM08 • Room: E353C • Gastrointestinal (Liver Imaging)
03:30-05:00 PM • MSEP44 • Room: S402AB • RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)
04:30-06:00 PM • SPSC44 • Room: E404AB • Controversy Session: The Evolving Role of Image-guided Pulmonary, Hepatic, and Renal Mass Biopsy: Current Indi...
04:30-06:00 PM • SPSC46 • Room: N227 • Controversy Session: Controversies in Imaging Strategies for HCC in Cirrhosis

Thursday, December 05, 2013
07:15-08:15 AM • SPSC05 • Room: E351 •
08:30-10:00 AM • MSE551 • Room: S406B • Essentials of Gastrointestinal Imaging
08:30-10:00 AM • RC608 • Room: E450A • The Acute Abdomen and Pelvis (An Interactive Session)
08:30-10:00 AM • RC609 • Room: E353C • Gastrointestinal: CT Colonography Update (An Interactive Session)
08:30-10:00 AM • RC610 • Room: S103CD • Abdominal Vascular: Ultrasound and Doppler
08:30-10:00 AM • RC631 • Room: S403A • Tumor Ablation beyond the Liver: How-to and Preliminary Results
08:30-10:00 AM • RC651 • Room: E261 • Emergency Body MRI: Vascular Emergencies, Abdominal Emergencies and the Pregnant Patient (How-to Workshop)
10:30-12:00 PM • SSQ05 • Room: N226 • Emergency Radiology (Imaging Abdominal Emergencies)
Ectopic Retrocolic Retroduodenal Subhepatic Duplicated Gallbladder Leading to Repeat Cholecystectomy

LL-GIE1222
Ahmed Ba-Ssalamah, MD
Nina Bastati, MD
Richard Nolz

PURPOSE/AIM
Illustrate the imaging pitfalls in detection of an aberrant gallbladder using a case report of an initially unrecognized retroplaced gallbladder duplication that resulted in avoidable imaging and repeat surgery.

Review the differential diagnoses, anatomy, classification systems of gallbladder duplication.

Discuss the importance of close collaboration between the surgeon and the radiologist to achieve optimal patient care in cases of gallbladder duplications.

CONTENT ORGANIZATION
Imaging findings in a patient with an initially unrecognized retroplaced gallbladder duplication that resulted in avoidable imaging and repeat surgery.

Review of anatomy, differential diagnoses, imaging findings and various classification systems of multiple gallbladders.

Discuss the importance of close collaboration between the surgeon and the radiologist to avoid diagnostic errors, decrease patient morbidity, reduce health care cost and avoid repeat surgery.

SUMMARY
Learn to identify gallbladder duplications preoperatively to avoid injuries, unnecessary imaging or reoperation.

Recognize imaging features of gallbladder duplication.

Become familiar with the new classification of multiple gallbladders.

Understand the importance of a close collaboration between a radiologist and a surgeon as essential in guiding management, reducing health care cost, and improving patient outcomes.
Hypervascular Hepatic Tumors: Dynamic CT and MR Imaging Findings with Pathological Correlation

Naofumi Matsunaga, Takayuki Kishi, Etsushi Iida, Takaaki Ueda, Takeshi Fujita, Masahiro Tanabe

PURPOSE/AIM
To demonstrate the broad spectrum of morphologic and functional features of primary sclerosing cholangitis (PSC).

To describe the performance of different imaging modalities, including invasive ERCP and non-invasive conventional T2-weighted MRCP, as well as gadobenate acid-enhanced T1 MRCP.

CONTENT ORGANIZATION
Accurate and early diagnosis of PSC is crucial, and ERCP has been considered the gold standard. In the last decade, conventional T2 w-MRCP was introduced as a non-invasive technique with high sensitivity and specificity. However, this technique still suffers from many limitations. More recently, new MRI techniques, such as diffusion-weighted imaging (DWI) and gadobenate acid-enhanced T1 MRCP have been introduced, which enable early noninvasive detection of bile duct abnormalities, even in asymptomatic patients, and early detection of complications, such as fibrosis and cholangiocarcinoma.

SUMMARY
For imaging of PSC, the combination of conventional T2w MRCP and gadobenate acid-enhanced T1w MRCP has a diagnostic value comparable to ERCP. The technical tricks that can increase the diagnostic performance of each technique.

Gallbladder Adenomyomatosis: Are We Sure to Know It?

Matteo Bonatti, MD
Norberto Vezzali
Luigia Gentile
Federica Ferro
Patrizia Perner
Guido Mazzoleni
Arber Golemi
Roberto Pozzi Micelli
Giampietro Bonatti

PURPOSE/AIM
To help the radiologist in familiarizing with the possible appearances of gallbladder adenomyomatosis (GA) at US, CEUS, CT, MR and PET/CT in order to prevent interpretation mistakes.

CONTENT ORGANIZATION
1. To describe the pathological substrate of GA (with drawings and images of anatomical specimens) and to correlate it with consequent imaging findings.
2. To describe US, CEUS, CT, MR and PET/CT findings in GA (with images), specifying accuracy and limits of each method, and to highlight the technical tricks that can increase the diagnostic performance of each technique.
3. To show a case series of gallbladder adenomyomatosis and possible differentials (quiz style, the reader is asked to guess the right answer).

SUMMARY
Gallbladder adenomyomatosis is a common finding in cholecystectomy specimens (2-9%), but, in our opinion, it is not always completely understood between radiologists. US is extremely accurate in diagnosing GA, particularly if high resolution probes and Color-Doppler are used, whereas contrast material administration doesn't add significant advantages to real time US. MR shows an high accuracy in diagnosing GA, thanks to its contrast resolution, whereas CT clearly shows GA, but its specificity is limited because of its insufficient contrast resolution. PET/CT is almost exclusively useful for its high negative predictive value.

Air Within the Gastric Wall: A Review and Distinguishing Features between Gastric Emphysema and Emphysematous Gastritis

Kenny Q Sam, MD
Leonardo I Valentin, MD
Karuna A Munjal, MD
Margot Rodriguez, MD

PURPOSE/AIM
1. To explore etiology of gastric emphysematous changes
2. To discriminate the imaging characteristics of gastric emphysema versus emphysematous gastritis
3. To review the clinical management and prognosis of gastric emphysema and emphysematous gastritis

CONTENT ORGANIZATION
Intramural air in the stomach can be a very rare finding. The two main underlying entities, gastric emphysema (GE) and emphysematous gastritis (EG) are often confused. GE is characterized by a mechanical injury to the abdominal wall. Underlying etiologies such as gastric outlet obstruction, diabetes gastroparesis, and eating disorders have been implicated. EG is caused by an underlying infectious process and carries an ominous prognosis (greater than 50% mortality rate). While imaging patterns are by no means definitive, they provide important clues as to what disorder we are dealing with. Imaging findings can be seen on simple abdominal radiographs and further characterized by computed tomography. Patients with GE usually respond well to conservative and medical management. EG patients are often treated with empiric antibiotics and surgery.

SUMMARY
Gastric emphysema and emphysematous gastritis are two distinct entities with different treatment and prognoses. Radiologists must recognize these processes and provide appropriate details to contribute to the patient's management.

Hypervascular Hepatic Tumors: Dynamic CT and MR Imaging Findings with Pathological Correlation

Masahiro Tanabe, Takeshi Fujita, Takaaki Ueda, Etsushi Iida, Takayuki Kishi, Naofumi Matsunaga

PURPOSE/AIM
The purpose of this exhibit is to illustrate dynamic CT and MR imaging findings of various hypervascular hepatic tumors in order to help improve the radiologist’s diagnostic accuracy of these entities, and to highlight key differential diagnostic points of hypervascular nodules with histopathologic correlation.

CONTENT ORGANIZATION
1) Review of dynamic CT and MR of hepatic hypervascular tumors (hepatocellular carcinoma, focal nodular hyperplasia, hepatocellular adenoma, cavernous hemangioma, sclerosing hemangioma, cholangioluminal carcinoma, MALT lymphoma, metastatic tumor caused by...
renal cell carcinoma, carcinoid tumor, acinar cell carcinoma, and melanoma, hepatic actinomycosis).

2) Highlight of key points for the correlation of radiologic and pathologic features.

3) Utility of contrast enhanced dynamic CT and MR imaging in the differential diagnosis.

SUMMARY

Differential diagnoses of hypervascular hepatic tumors include the wide spectrum from benign tumors to malignancies. Each lesion has typical CT/MR features in morphology, location, signal intensity and enhancement pattern that are useful for diagnosis. This exhibit will provide a diagnostic algorithm to aid reasonable differential diagnosis with emphasis on contrast enhanced dynamic CT, MR imaging, and pathologic features.

Spectrum of Post-treatment Imaging Findings in Liver-directed Interventional Oncology: Implications of Interpretation for Patient Management

LL-GIE1226
Selim R Butros, MD
Florian J Fintelmann, MD
Raul N Uppot, MD
Peter R Mueller, MD *
Debra A Gervais, MD *
Ronald S Arellano, MD

PURPOSE/AIM
To review the spectrum of post treatment imaging findings in patients with hepatocellular carcinoma (HCC).

CONTENT ORGANIZATION
Interpretation of post treatment imaging findings of the liver can be challenging. With the advent of various treatment methods in the management of HCC, it is imperative to have a thorough understanding of the expected imaging findings in the treated liver. A comprehensive case based review of therapy specific imaging features will be performed with emphasis on clinical implications of interpretation:

- OPTN classification and its implications for transplantation.
- Percutaneous thermal ablation: What to call residual or recurrent disease.
- Transarterial embolization:
  - Expected treatment changes of radioembolization and chemoembolization
  - Tumor response to embolization: enhancement pattern and interval growth.
  - Treatment success or treatment failure?
- Surgical resection: Spectrum of complications
- Portal vein embolization: What to look for.
- Proton beam therapy: New treatment on the horizon.

SUMMARY
This exhibit educates radiologists on percutaneous, endovascular and surgical treatment options for HCC and their respective post treatment imaging findings. Implications of imaging findings for patient management will be discussed in a case-based format.

Hepatocellular Carcinoma: Can Genomic Medicine Guide Therapy?

LL-GIE1228
Richard L Hesketh
Siddharth Govindan, MD
Patrick D Sutphin, MD, PhD
Amy R Deipolyi, MD, PhD
Rahmi Oklu, MD, PhD

PURPOSE/AIM
The purpose of this exhibit is to present a framework for utilizing genomic data to refine clinical management incorporating recent developments in the field of circulating tumor cells and radiogenomics.

CONTENT ORGANIZATION
1. Current understanding of the molecular mechanisms that play a role in the development of HCC. 2. An overview of recent developments regarding circulating tumor cells (CTCs) and the combination of genotypic and radiological phenotype (radiogenomics). 3. To provide a toolkit that would incorporate clinical information, imaging data, CTCs and radiogenomics into clinical-decision support to identify the best intervention for HCC.

SUMMARY
The 'omics revolution is facilitating a personalized approach to improving outcome by refining diagnosis, staging, treatment and monitoring. Furthermore, the promise of being able to target a range of specific oncogenesis drivers at a molecular level offers exciting new therapy prospects. This exhibit will provide a unique perspective combining our understanding of the molecular mechanisms of HCC development with the potential of CTCs and radiogenomics to potentially change the drivers of decision-making used in current practice.

HELLP Syndrome: Diagnosis and Management by Radiologists

LL-GIE1229
Marie-Pier Langis, MD
Mathieu Blanc, MD
Elie Karam
Gerard R Schmutz, MD
The-Bao Bui, MD

PURPOSE/AIM
1. Review the pathophysiology and clinical data of HELLP syndrome 2. Learn imaging characteristics of HELLP syndrome and life-threatening signs 3. Discuss treatment options of the disease and growing role of interventional radiology

CONTENT ORGANIZATION

SUMMARY
HELLP syndrome presents as an abdominal imaging emergency with hepatic hemorrhage. 2. Ongoing liver hemorrhage and subcapsular rupture warrant emergent treatment. 3. Percutaneous embolization of hepatic artery branches is an effective first-line treatment that can prevent maternal and fetal demise.

Making Dangerous Progress: The Temporal Evolution of Radiologic Findings in Acute Bowel Ischemia

LL-GIE1230
Brunner's gland adenoma were analyzed and summarized. 6 lesions were located at the duodenal bulb, and 2 at the border on ball drop, gastrointestinal series were retrospectively reviewed, and compared with pathological manifestations. The imaging characteristics of duodenal 8 cases of Brunner's gland tumor pathologically proving imaging included CT of 8 patients, MRI of one patient and 3 cases' CONTENT ORGANIZATION

PURPOSE/AIM
- Review various radiographic and computed tomographic findings associated with acute bowel ischemia of differing etiologies
- Organize these findings into an easily approachable schema emphasizing their expected temporal progression
- Highlight how this expected temporal progression leads to identification of at risk patients prior to the development of potentially lethal complications

CONTENT ORGANIZATION
- Prevalence and outcomes of acute bowel ischemia
- Review the importance of radiological assessment in diagnostic algorithms of acute bowel ischemia
- Presentation of the early, intermediate, and late radiographic findings of acute bowel ischemia
- Discuss how treatment algorithm branch points are affected by radiologic findings (early vs intermediate vs late)

SUMMARY
Acute bowel ischemia presents in various ways, both clinically and radiologically, based on duration and severity of injury. As the complications of mischaracterization can be lethal and treatment algorithms are heavily influenced by radiologic assessment, imagers must have a clear understanding of how various levels of ischemic injury evolve over time. With this understanding, radiologists can better inform their clinical colleagues of where a patient may fall on the spectrum of disease and the urgency with which a soon to be gravely ill patient must be therapeutically addressed.

Abdominal Gas - Inside and Out

LL-GIIE1231
Zeid Al-Ani, MBCh, MRCP
Bella Huasen, MBCh, MRCS
Sathi A Sukumar, MD
Velauthan Rudralingam, MBCh

PURPOSE/AIM
- Computerized Tomography (CT) is the most used modality when assessing patients with acute abdominal symptoms. Recognising and interpreting abnormal abdominal gas pattern is challenging and critical in planning further management.

CONTENT ORGANIZATION
This poster displays a pictorial presentation of various patterns of abnormal gas within the abdomen and pelvis. This includes both the solid organs, cavities and the bowel wall. We aim to demonstrate the whole spectrum of appearances from normal physiological causes to benign pneumatosis and to serious and life threatening diagnoses. A systematic approach to their interpretation will be described emphasising key and important differentiating features as well as the commonly encountered pitfalls. This review also illustrates the different anatomical communication routes through which gas travels in the abdominal cavity. Correlation between CT, plain radiography and (when relevant) ultrasound findings is provided.

SUMMARY
Interpreting and recognising abnormal pattern of abdominal gas can be challenging and daunting when faced with a sick patient as further management is often dictated by the radiologist communicating this to the clinician, very often a surgeon. All radiologists must be familiar with this commonly encountered but critical variation in image recognition.

CT Diagnosis of Inflammatory Conditions at Lower Gastrointestinal (GI) Tract

LL-GIIE1232
Akira Furukawa, MD
Akitoshi Inoue, MD
Shuzo Kanasaki, MD
Katsushi Hayakawa, MD
Shigeru Furui, MD
Michio Yasamaki, MD
Shigetaka Satô, MD
Shinichi Ota, MD
Naoki Kono, MD
Kiyoshi Murata, MD
Yen-Wei Chen
Natsuko Hayashi
Tomohiro Hirose, MD
Tetsutomo Sakamoto

PURPOSE/AIM
- The purpose of this presentation are: 1) To recognize key CT findings for assessment of bowel pathologies. 2) To learn conditions predominantly involve small bowel, ileo-cecal region, right colon and left colon.

CONTENT ORGANIZATION
- Pattern recognition of CT findings at bowel wall @ CT density; hemorrhagic, edematous, pneumatosis @ Wall thickening and thinning @ Patterns of enhancement; absent, hyper enhancement, stratification @ Length of involvement Conditions affecting small bowel; Henoch-Schönlein purpura, eosinophilic enteritis, SLE, GVHD, ischemia Conditions affecting ileo-cecal region; Crohn disease, tuberculosis, various infections, Meckel's diverticulum Conditions affecting right colon; Typhlitis, O-157Colitis, phlebosclerotic colitis, tuberculosis, Crohn disease Conditions affecting left colon; ischemic colitis, pseudomembranous colitis, UC, amebiasis, obstructive colitis Summary and differential diagnosis

SUMMARY
To learn to categorize various abnormal CT findings to discuss pathology of bowels. To learn how to narrow diagnosis of bowel diseases from basically non-specific CT findings. To learn differential diagnosis of bowel diseases depending on location of the diseases. To learn potential and limitation of CT in the diagnosis of lower GI tract inflammatory diseases.

Image Features of Duodenal Brunner's Gland Adenoma

LL-GIIE1233
Liping Deng, MD

PURPOSE/AIM
- To analyze the image features of duodenal Brunner's gland adenoma to improve it's diagnostic accuracy

CONTENT ORGANIZATION
- 8 cases of Brunner's gland tumor pathologically proven imagings including CT of 8 patients, MRI of one patient and 3 case's gastrointestinal serie were retrospective reviewed, and compared with pathological manifestations. The imaging characteristics of duodenal Brunner's gland adenoma were analyzed and summarized. 6 lesions were located at the duodenal bulb, and 2 at the border on ball drop, which was coincided with the natural distribution of Brunner's gland. All 8 lesions were polyloid tumor, 7 lesions showed as finger or bat. Most of the lesions were well-defined with mild to obvious enhancement scattering low density cyst, which was associated with the
SUMMARY
duodenal Brunner's gland adenoma occurred mainly in the duodenal bulb as a pedicle polypoid tumor, and can be causing gastrointestinal bleeding, intestinal obstruction or intussusception. Mutiple phase CT scan and reconstruction combined with endoscopic ultrasonography can be useful to make diagnosis.

Intestinal Tuberculosis: Still Here! A Multimodality Imaging Approach

PURPOSE/AIM
The aim of this exhibit is to describe common and uncommon imaging findings with Magnetic Resonance Enterography (MRE), abdomen computed tomography (CT), and barium studies of patients with intestinal tuberculosis (IT).

CONTENT ORGANIZATION
1. Brief review of etiology, pathology, clinical course, and management of intestinal tuberculosis.
2. Illustrative review of both common and uncommon findings with a comprehensive approach (MRE, CT, and barium studies).
3. Case-based description of the main differential diagnoses and identification of potential imaging pitfalls, a pathway to correct diagnosis.

SUMMARY
1. Tuberculosis is highly prevalent in Mexico; this condition often poses a diagnostic challenge because it shares many clinical and radiologic features with other entities.
2. Although the radiologist plays a decisive role in describing the spread of this disease, the final diagnosis requires histopathology.
3. The potential role of MRE is distinguishing active inflammatory or intestinal edema from fibro-stenotic disease by means of T2 SSFSE, Diffusion-weighted, and Dynamic Contrast-enhanced MR imaging sequences.

Multi-modality Imaging of Small Bowel Neoplasms

PURPOSE/AIM
1. To review the imaging findings of both common and rare small bowel neoplasms across different imaging modalities (small bowel follow through, enteroclysis, CT, MRI). 2. Comparison of the benefits, limitations, and pitfalls of these various imaging modalities in the evaluation of patients with small bowel neoplasms.

CONTENT ORGANIZATION
Introduction of radiologic and endoscopic methods for diagnosis of small bowel neoplasms.
Overview of the distinguishing CT, MR, and fluoroscopic features of benign (hemangioma, lipoma, neural tumors, GIST/leiomyoma, adenoma) and malignant (adenocarcinoma, lymphoma, carcinoïd, GIST, metastatic) small bowel neoplasms, illustrated by representative case images in correlation with histopathology.
Discussion of the technical aspects, relative advantages, and limitations of these modalities in the diagnosis of small bowel neoplasms.

SUMMARY
Diagnosis of small bowel neoplasms is a challenging clinical task. Recognizing the range of imaging appearances and role of different modalities in evaluating small bowel neoplasms is essential for radiologists to be effective in their diagnosis and management.

Comprehensive Preoperative Surgical Planning of Gastric Cancer with MDCT Gastrography: Emphasis on Localization of Gastric Cancer Using Virtual Endoscopic Imaging
A. Tumor staging
1) Current status of MDCT in T staging
2) Key issues to be clarified
B. Nodal staging
C. Metastasis staging
D. Normal vascular anatomy and variants relevant to surgery
5. Conclusion

SUMMARY
MDCT gastrography allows comprehensive preoperative surgical planning of gastric cancer. High quality of gastrographic image allows accurate local and distant staging including exact localization of gastric cancer. In addition, angiographic images can display normal vascular anatomy and variants that are familiar to surgeons to avoid unexpected vascular injury during surgery.

Stump Appendicitis; Surgical Background, CT Appearance, and Imaging Mimics

URT-1238
Jennifer Johnston, MD
Daniel T Myers, MD
Todd Williams, MD
Mohammad Raoufi, MD

PURPOSE/AIM
1. Raise awareness of the rare but clinically significant diagnosis of stump or remnant appendicitis.
2. Review surgical literature of stump appendicitis with emphasis on factors that predispose patients to development of stump appendicitis.
3. Demonstrate the CT imaging findings of stump appendicitis with histopathologic correlation, and alternative diagnoses that may mimic stump appendicitis.

CONTENT ORGANIZATION
1. Background surgical literature and predisposing factors:
   - Open versus minimally invasive techniques
   - Length of appendiceal remnant
   - Complicated appendicitis at initial presentation
2. Illustrate CT imaging findings of pathologically confirmed stump appendicitis and compare with conventional appendicitis.
3. Review other processes that may mimic this diagnosis on CT imaging.
   - Infected surgical drain tract
   - Endometriosis
   - Inflammatory Bowel Disease
   - Serosal tumor implants

SUMMARY
Major teaching points:
1. Early recognition and treatment of stump appendicitis are critical to prevent delay in diagnosis and avoid complications.
2. Illustrate alternative diagnoses that may simulate stump appendicitis and avoid false positive diagnoses that could lead to unnecessary surgery.

CT Imaging of Appendix: Beyond Appendicitis

LL-GIE1239
Ajay K Singh, MD
Ruth W Magera, MD
Parul Penkar, MBBS
Laura L Avery, MD
Hani H Abujudeh, MD, MBA *
Robert A Novelline, MD
Sanjay Saini, MD

PURPOSE/AIM
This educational exhibit describes the imaging appearance of various appendiceal pathologies other than acute appendicitis. The conditions of the appendix included in this poster are mucocele, diverticulosis, appendiceal neoplasm, herniation, inflammatory bowel disease, and foreign bodies.

CONTENT ORGANIZATION
Anatomy and morphology of appendix
Imaging protocols: Oral or rectal contrast?

SUMMARY
Although, acute appendicitis is the most widely known pathology of the appendix, the awareness of other conditions effecting the appendix is important for the radiologist in distinguishing surgical from nonsurgical abdomen.

Familiarize your Eyes with Noise: An E-learning Course in Low-dose CT in the Diagnosis of Acute Appendicitis in Adults

LL-GIE1240
Hyun Kyung Yang, MD
Hyunsik Woo, MD
Min Hee Lee, MD
Bohyoung Kim, PhD
Kyoung Ho Lee, MD
Jae Min Jo
Inquiry Location

PURPOSE/AIM
To enhance radiologists' diagnostic performance in low-dose CT for the diagnosis of acute appendicitis in adults.

CONTENT ORGANIZATION
1. The need of radiation dose reduction in these patients.
2. Published evidences justifying the use of low-dose CT.
   1) Retrospective studies.
   2) A prospective study.
3. Techniques for reducing the radiation dose.
   (1) "Scan thin, review thick" principle: multiplanar sliding slab averaging technique.
4. CT diagnostic criteria of appendicitis.
5. How to use the e-learning course.
6. E-learning course of 30 test cases in a quiz format.
   (1) Thin-section CT images obtained with a median 2-mSv effective dose are presented by using the multiplanar sliding slab averaging technique followed by the feedback on the diagnosis and appendix location in each case.
7. Feedback on the learning curve.

SUMMARY
1. Understand the need of low-dose CT in these patients with long life expectancies.
2. Review published evidences justifying the use of low-dose CT.
3. Understand the need of multiplanar sliding slab averaging technique to overcome the image noise.
4. Practice the interpretation of the noisy CT.

Portal Hypertension: A Pictorial Review of Portosystemic Collateral Pathways and Radiologic Interventions

Anirudh Mirakhur, MD
Mollie C Ferris, DVM, MD
David J Sadler, MD
Alex Aspinall, MD, FRCPC
Robin R Gray, MD
Jason K Wong, MD, MSc *

PURPOSE/AIM
1. To discuss the entire spectrum of portosystemic collateral pathways in the thorax and abdomen, through multi-modality imaging. 2. To provide a brief overview of established interventional radiologic techniques for treatment of portal hypertension and related complications.

CONTENT ORGANIZATION
Pathophysiology of Portal Hypertension Anatomic sites of portosystemic confluence in the thorax and abdomen - Coronary, Esophageal, Paraesophageal and Cardiophrenic varices - Gastric varices and Gastrorenal shunts - Perisplenic varices and Splenoportal/Splenozygotic shunts - Paraumbilical and Abdominal Wall collaterals - Omental and Mesenteric collaterals - Other collateral pathways Radiologic Interventions in Portal Hypertension - Transjugular Intrahepatic Portosystemic Shunt (TIPS) - Balloon-occluded Retrograde Transvenous Obliteration of Varices (BRTO)

SUMMARY
1. The portosystemic collateral channels are numerous, widespread and varied in appearance. 2. TIPS reduces portal venous pressure itself, in order to mitigate complications such as variceal hemorrhage, refractory ascites, etc. 3. BRTO augments hepatopetal portal flow and increases portal venous pressure, but it is less invasive than TIPS and can be performed on patients with poor hepatic reserve and encephalopathy.

Contrast Enhanced Ultrasound is Useful for Characterising Hepatic Vessels Thrombosis

Demosthenes D Cokkinos, MD
Eleni Antypa
Panagiotis Tserotas, MD
Dimitrios Tomais
Eleni Testempassi, MD
Ploutarhos A Piperopoulos, MD, PhD

PURPOSE/AIM
To examine the differences in appearance between benign and malignant thrombosis of the hepatic vessels on contrast enhanced ultrasound (CEUS).

CONTENT ORGANIZATION
Cases of benign and malignant pathological entities of the liver with variable degrees of thrombosis of the hepatic vessels (portal vein, hepatic veins, intrahepatic inferior vena cava) are presented. Benign thrombosis shows no flow in colour and power Doppler and no enhancement on CEUS. Malignant thrombosis presents with pulsatile flow on colour and power Doppler and contrast uptake on CEUS. Pathophysiologic and imaging differences between thrombosis of the liver vessels are explained, with examples of baseline US and CEUS, as well as CT/MR when available.

SUMMARY
CEUS can be helpful in the differentiation between benign and malignant thrombosis of hepatic vessels.

Fluoroscopic Findings Post Per-oral Endoscopic Myotomy (POEM) Procedure

Carla B Harmath, MD
Lori A Goodhartz, MD
Paul Nikolaidis, MD
Jeanne M Horowitz, MD
Senta M Berggruen, MD
Nancy A Hammond, MD
Vahid Yaghmai, MD
Frank H Miller, MD
Eric Hungness, MD
Erza Teitlebaum

PURPOSE/AIM
The purpose of the exhibit is to illustrate the anatomy, surgical procedure, normal and abnormal findings seen on esophagram in patients who underwent POEM.

CONTENT ORGANIZATION
Introduction of the normal anatomy and pathology Clinical indications for POEM Description of the surgical procedure Common radiology findings associated with POEM procedure Abnormal findings and complications of POEM procedure

SUMMARY
POEM is a relatively new procedure for the treatment of achalasia. At the end of the exhibit the viewer should:
- Understand normal anatomy and indications for POEM
- Learn how the surgical procedure is performed
- Become familiar with common expected radiological findings after this procedure
- Be able to identify complications
### MRI Diagnosis of Inflammatory Pseudotumor

**James R Costello, MD, PhD**  
**Bobby T Kalb, MD**  
**Surya Chundru, MD**  
**Hina Arif Tiwari, MD**  
**Khalil N Salman, MD**  
**Felipe Cortopassi**  
**Diego R Martin, MD, PhD**

**PURPOSE/AIM**
MRI incorporates multiplanar and multisequence T1w and T2w imaging to diagnose hepatic inflammatory pseudotumors. This exhibit aims to educate the viewer on the histopathology and pathogenesis of hepatic inflammatory pseudotumors and their distinguishing MR imaging characteristics, unique from other diagnostic considerations.

**CONTENT ORGANIZATION**
1. Description of histologic features of hepatic inflammatory pseudotumors and discussion of several hypotheses on their pathogenesis.  
2. MR imaging features of hepatic inflammatory pseudotumors using a combination of T2w and dynamic contrast enhanced 3D Gradient T1w sequences.  
3. Discussion of distinguishing imaging features between hepatic inflammatory pseudotumors and aggressive mimics such as metastases, lymphoma, and intrahepatic cholangiocarcinoma.  
4. Brief summary section highlighting important points of presentation.

**SUMMARY**
Body MR imaging can differentiate inflammatory pseudotumors from aggressive mimics such as metastases, lymphoma, and intrahepatic cholangiocarcinoma. This educational exhibit will highlight MR imaging features of inflammatory pseudotumors and distinguish these imaging characteristics from malignant diagnostic considerations.

### Theory and Considerations for Gadoxetate Disodium as a Dual Energy Contrast Agent for Hepatic Imaging

**David N Bolus, MD**  
**John V Thomas, MD, MRCP**  
**Desiree E Morgan, MD** *

**PURPOSE/AIM**
Dual Energy CT theoretically allows for optimized detection and quantitation of contrast agents based on effective Z and K edge characteristics. We explore the use of gadolinium agents, specifically Gadoxetate Disodium, though quantitative phantom model analysis. Initial data obtained from a limited clinical trial as a hepatic contrast agent is reviewed, including dosage and timing considerations.

**CONTENT ORGANIZATION**
1) Introduction  
2) Theory and background  
3) Phantom model analysis  
4) Initial clinical analysis

**SUMMARY**
Creative use of Dual energy CT facilitates the use of alternative contrast agents. The theoretical and practical performance characteristics of Gadoxetate Disodium as a specific contrast agent are described, including assessment of its use as a potential hepatic contrast agent.

### Liver Transplant Anastomoses: What Every Radiologist Needs to Know

**Nik Kolicaj, MD**  
**Seyed Amin Astani, MD, MBA**  
**Scott G Sturza, MD**

**PURPOSE/AIM**
The goal of this educational exhibit is to provide a review of the anatomy and various surgical techniques employed in arterial, biliary, and portal and hepatic venous anastomoses in orthotopic and living related liver transplantation.

**CONTENT ORGANIZATION**
Various anastomoses techniques in the following categories and their indications, advantage, and disadvantage will be discussed with diagrammatic and imaging correlation:  
1. Hepatic vein/IVC anastomoses including end-to-end anastomosis of the upper and lower vena cava, and piggy back technique  
2. Portal venous anastomoses including end-to-end and various jump grafts  
3. Anastomoses of hepatic artery with classic or variant anatomy including end-to-end and various jump graft  
4. Biliary system anastomoses including end-to-end with or without T-tube placement, hepaticojejunostomy (Roux – Y), choledochoduodenostomy, and side-to-side biliary anastomoses.

**SUMMARY**
Knowledge of surgical anastomoses is required to successfully navigate the arterial, venous, and biliary trees for interventional and interpretive purposes as well as to avoid confusing a normal appearance of an anastomosis with pathology. The knowledge of arterial, biliary, portal and hepatic venous surgical anastomoses is essential in the interpretation of diagnostic imaging and performance of liver transplant interventions.

### Groove Pancreatitis

**Melissa L Neveu, MD**  
**Jerome L Kao, MD**  
**Peter T Petruzzi, MD**

**PURPOSE/AIM**
The purpose of this exhibit is:  
1. To review the pathophysiology, diagnosis, and treatment of groove pancreatitis.  
2. To discuss CT and MR imaging characteristics of groove pancreatitis utilizing images from our institution to illustrate the imaging findings.  
3. To discuss the differential diagnosis of groove pancreatitis, with emphasis on differentiating features between groove pancreatitis and pancreatic head carcinoma.

**CONTENT ORGANIZATION**
Pathophysiology of groove pancreatitis Review of imaging findings  
- CT findings  
- MRI/MRCP findings  
Sample cases and mimics Diagnosis Treatment

**SUMMARY**
Groove pancreatitis is an uncommon form of focal chronic pancreatitis affecting the pancreaticoduodenal groove. Differentiation between...
Pancreatic Fluid Collections: Classification, Imaging Characteristics, and Management

LL-GIE1252
Jerome L Kao, MD
Melissa L Neveu, MD
Peter T Petruzzi, MD

PURPOSE/AIM
1. To differentiate the four main types of pancreatic fluid collections
2. To recognize the impact that precise classification has on proper management
3. To briefly review suggested monitoring and treatment options

CONTENT ORGANIZATION
- Background and classification system
- Pathophysiology and natural history
- CT / MR imaging characteristics
- Recommended follow-up imaging / management options
- Sample cases
- Conclusion / Teaching points

SUMMARY
Proper evaluation and classification of pancreatic fluid collections (PFC) according to the revised 2008 Atlanta classification are critical for appropriate management. Proper classification can be challenging as it depends on temporal relationships, imaging characteristics, and pathology findings. The goal of this educational exhibit is to provide the reader with a clear understanding of the four PFC types according to the revised Atlanta classification so that precise, standardized terminology is used to communicate findings and guide treatment planning.

Visually Isoattenuating Pancreatic Adenocarcinoma at MDCT. Value of US and MRI

LL-GIE1253
Cecilia Carrera, MD, PhD
Andres Zanfardini, MD
Silvina E De Luca, MD
Lorena Alarcon, MD
Eduardo P Eyheremendy, MD
Nicolas Goldaracena
Ingrid Klass

PURPOSE/AIM
To characterize the imaging findings of visually isoattenuating pancreatic adenocarcinoma in MDCT, their secondary signs and their correlation with MRI and US.

CONTENT ORGANIZATION
We reviewed MDTC performed in 85 patients with a suspected pancreatic mass between September 2009 and February 2013. We obtained in all the cases multiphase dynamic dual-phase scan and MIP reformatted images. Isoattenuating tumors were found in 6 of them, all histologically confirmed. These cases were diagnosed by MRI in 66,7%, US in 66,7% and both in 33,3%. Retrospectively we found one or more subtle secondary signs on MDCT in all of them.

SUMMARY
Isoattenuating pancreatic adenocarcinoma are a small but meaningful percentage of pancreatic cancer (5,4%). Secondary signs, such as mass effect and/or convex contour abnormality, loss of the normal acinar glandular pattern, dilated biliary and pancreatic ducts, interrupted pancreatic duct, and atrophic distal pancreatic parenchyma, are helpful in the diagnosis. Although US may be a more sensitive method in the detection of these tumors in cases with adequate glandular visualization; MRI can improve the diagnosis providing better tissue characterization, especially with diffusion sequence and ADC map.

Acoustic Radiation Force Impulse (ARFI) of the Pancreas

LL-GIE1254
Mirko D’onofrio, MD
Riccardo De Robertis, MD
Stefano Canestrini
Emanuele Demozzi
Roberto Pozzi Mucelli

PURPOSE/AIM
Describe the pancreatic applications of ARFI, a new technique able to distinguish tissues on the basis of their stiffness.

CONTENT ORGANIZATION
Short-duration acoustic radiation forces generate mechanical waves producing displacements through a ROI. The response reflects the viscoelastic properties related to the resistance offered to the wave propagation, obtaining a number (meter/second) for shear waves velocity: soft tissues generates a great displacement and low velocity values, stiff tissues produces minor displacements and higher values. Pancreas of young people is homogenously soft (mean value 1.40 m/s), while in elderly the velocity values becomes higher. Dorsal pancreas can present as a hypoechoic structure and should not be confused with local inflammation or tumor: ARFI provides similar values in both parts of a healthy pancreas. Ductal adenocarcinoma is a stiff mass, for the presence of fibrosis, with a high wave velocity value. High values are reported also in chronic pancreatitis. The test of ARFI on fluids provided different responses according to viscosity: serous cystadenoma is characterized by simple fluid content, whereas mucinous cystic lesions have high viscous and particle fluid content.

SUMMARY
ARFI is a promising technique for the differentiation of tissues and can be useful in the diagnosis of pancreatic diseases.

Rare Presentations of Common Pancreatic Neoplasms

LL-GIE1255
Mirko D’onofrio, MD
Riccardo De Robertis, MD
Paolo Tinazzi Martini
Emilio Barbi
Stefano Canestrini

PURPOSE/AIM
Describe the pancreatic applications of ARFI, a new technique able to distinguish tissues on the basis of their stiffness.

CONTENT ORGANIZATION
Short-duration acoustic radiation forces generate mechanical waves producing displacements through a ROI. The response reflects the viscoelastic properties related to the resistance offered to the wave propagation, obtaining a number (meter/second) for shear waves velocity: soft tissues generates a great displacement and low velocity values, stiff tissues produces minor displacements and higher values. Pancreas of young people is homogenously soft (mean value 1.40 m/s), while in elderly the velocity values becomes higher. Dorsal pancreas can present as a hypoechoic structure and should not be confused with local inflammation or tumor: ARFI provides similar values in both parts of a healthy pancreas. Ductal adenocarcinoma is a stiff mass, for the presence of fibrosis, with a high wave velocity value. High values are reported also in chronic pancreatitis. The test of ARFI on fluids provided different responses according to viscosity: serous cystadenoma is characterized by simple fluid content, whereas mucinous cystic lesions have high viscous and particle fluid content.

SUMMARY
ARFI is a promising technique for the differentiation of tissues and can be useful in the diagnosis of pancreatic diseases.
Stefano Canestrini
Roberto Pozzi Mucelli

PURPOSE/AIM
To show the atypical aspects of common solid and cystic pancreatic neoplasms. The images cases will be presented with multimodalities approach and pathologic explanation

CONTENT ORGANIZATION
Among the solid pancreatic neoplasms the ductal adenocarcinoma will be considered by showing cases of microcystic and IPMN-like appearances and different grade of possible vascularization. Moreover the atypical behaviour and presentations such as the autoimmune pancreatitis-like morphology will be imaged. The hypovascular aspect of endocrine tumors and atypical growing patterns will be presented.

Among the cystic pancreatic neoplasms the solid variants and appearance of serous cystadenoma will be presented. The atypical IPMNs in terms of aspect, in example solid, and grow pattern will be showed.

SUMMARY
Common pancreatic neoplasms may present with atypical imaging appearance. The radiologist should be aware of the possible more common variants and the pathological correlation to better report and manage each single case.

Diffusion-weighted Imaging: An Additional Value for the MRI Study of Pancreatic Neoplasms

LL-GIE1256
Mirko D’onofrio, MD
Riccardo De Robertis, MD
Paolo Tinazzi Martini
Stefano Canestrini
Stefano Crosara
Massimo Pregarz, MD
Roberto Pozzi Mucelli

PURPOSE/AIM
To show and discuss possible applications of diffusion-weighted imaging (DWI) for the study of pancreatic neoplasms, with presentation of emblematic cases, imaging-pathologic correlations and a review of the most recent literature

CONTENT ORGANIZATION
Many authors have reported the usefulness of DWI in the MRI evaluation of pancreatic diseases. Particularly, DWI has been reported to provide additional informations, even superior to those provided by MRI or CT, in the following scenarios: neoplasm detection and characterization, differentiation between benign and malignant masses, estimation of tumoral malignancy, evaluation of local extent, intra-abdominal staging

SUMMARY
DWI is an attractive technique, rapid, easy to perform and repeatable, which adds useful informations for the characterization and the staging of pancreatic neoplasms, and should be therefore added to conventional sequences in the MRI study for these tumors.

Ultra-low-dose Dual-energy CT Colonography: Techniques and Application to the Next-generation Colorectal Screening Examination

LL-GIE1259
Hiroyuki Yoshida, PhD *
Janne J Nappi, PhD *
Wenli Cai, PhD
Simone Mazzetti
Daniele Regge, MD

PURPOSE/AIM
(1) To learn about recent advances in dual-energy CT colonography (CTC2). (2) To understand the limitations of conventional single-energy colonography (CTC). (3) To understand the potential of computer-assisted ultra-low-dose CTC2

CONTENT ORGANIZATION
1. Overview of CTC2
2. The limitations of conventional CTC: small polyps, flat lesions, and laxative-free CTC
3. Computer-aided detection of flat lesions and small polyps in CTC2
4. Effect of bowel preparations and its virtual cleansing in CTC2
5. Optimal strategies of screening by computer-assisted laxative-free ultra-low-dose CTC2

SUMMARY
The teaching points will include (1) the pitfalls of conventional single-energy CTC, (2) the diagnostic benefits of computer-assisted CTC2, (3) the potential for the next-generation colorectal screening by computer-assisted ultra-low-dose CTC2.

Spectral Imaging Associated with Iso-osmolar Low Concentration Contrast Media Applied on Epigastric CT Scan

LL-GIE1260
Pan Liang
Jianbo Gao, MD

PURPOSE/AIM
1) To understand the basic theory and principles of Spectral Imaging associated with low concentration contrast media.
2) To illustrate the utility and benefit of Spectral Imaging associated with iso-osmolar low concentration contrast media in epigastric CT scan with animal data and clinical images.
3) Summarize experience for clinical use of optimal keV selection and improvement on epigastric CT scan.

CONTENT ORGANIZATION
1. Basics and Principles of Spectral imaging associated with low concentration contrast media: Monochromatic images of lower keV can provide higher signal intensity and CT value can be increased 20.6%, 45.7% and 77.6% for 55keV, 60keV, 65keV compared with 120kVp.
2. To illustrate optimal keV for vascular and organ evaluation and performance of optimal monochromatic images with animal data and clinical images.

SUMMARY
Spectral imaging with low concentration contrast media (visipaque 270) can provide both high quality of enhanced images at higher keV and vascular images at lower keV while iodine contrast dose can be greatly reduced. It is practical for clinical application.

From Tics to Perf to Pus and Gas: Angry Diverticulitis at Its Best: A Look at the Common and Unusual Complications of Diverticulitis

LL-GIE1261
PURPOSE/AIM

Diverticulitis is the most common colonic disease in the USA. As a result, it is essential for radiologists to be familiar with the common as well as its unusual complications. Fortunately, being the busiest county hospital in the Midwest, our ER treats a high volume of patients allowing us the opportunity to diagnose a large number of sigmoid diverticulitis cases. In this exhibit we propose a pictorial review of common and uncommon complications of sigmoid diverticulitis. In doing so, we will also review their underlying pathophysiologic mechanism. We will propose a checklist to identify the complications of diverticulitis.

CONTENT ORGANIZATION

1. Introduction
2. Presenting patient complaints
3. CT images of common and unusual complications
4. Explain pathophysiology of the complications
5. Checklist to exclude all complications
6. Summary

SUMMARY

We present common complications: bowel obstruction, perforation with peritonitis, abscess, pneumoperitoneum, strictures, fistulas to bladder, vagina, and skin. We also present unusual complications of sigmoid diverticulitis: mesenteric thrombophlebitis, fistula to fallopian tubes with endometritis and TOA, uterus, small bowel, urachus abscess, and portal venous gas. We want to propose a checklist to check for all the common and unusual complications that diverticulitis can present with.

Radiological Findings of Crohn Disease Revisited: Pictorial Review of Whole Gastrointestinal Tract Involvement in the Era of CT

Saya Horiuchi, MD
Takuya Ueda, MD
Makoto Goto
Takaharu Suzuki
Yukihisa Saida, MD

PURPOSE/AIM

The purpose of this exhibit is
1. To understand the pathophysiology of Crohn disease
2. To know the pathologic-radiologic correlations of Crohn disease
3. To review the radiographic features of whole gastrointestinal tract involvement of Crohn disease

CONTENT ORGANIZATION

1. Pathophysiology of Crohn disease
   - early stage: the submucosa and consists of lymphoid hyperplasia and lymphedema
   - transmural stage: it extends transmurally to the serosa
   - extramural stage: beyond to the mesentery and adjacent organs
2. Pathologic-radiologic correlations of Crohn disease: Double-contrast gastrointestinal examination and CT/MRI
   - Superficial mucosal lesion
   - Deep linear ulcer
   - Transverse ulcers and fissure ("cobblestone" appearance)
   - Sinus tract penetrating the serosa (Enteric fistula)
3. Anatomy and morphologic changes caused by the disease: case-based reviews
   - Esophagus
   - Small bowel
   - Colon
   - Fistulas

SUMMARY

The major teaching points of this exhibit are:
1. Knowledge of pathophysiologic of Crohn disease is essential to understand various radiologic features of the disease in whole gastrointestinal tract.
2. Double-contrast gastrointestinal examination still play essential role in detecting and assessing the disease.
3. CT is sometimes non-specific, but is sometimes useful to identify unidentified gastrointestinal tract involvement.

ItÂ’s Not Just Gas! Sonographic Evaluation of Intestinal Pathology

Roxana C Romero
Marcelo Ahumaran
Julia R Crosta, MD, MS
Maximiliano Francabandiera, MD, PhD
Fernando A Abramzon, MD
Juan P Biosci, MD
Guillermo H Primucci, MD

PURPOSE/AIM

Ultrasound is not the usual method chosen for the evaluation of the intestine, however, in our country is the first method of approach in the study of abdominal pain. The purpose of this paper is to describe using ultrasound imaging, differential diagnosis of intestinal pathology that can be addressed with this tool, grouping them according to their etiology.

CONTENT ORGANIZATION

Classification of findings:
1. Infectious-inflammatory causes: diverticular disease, Crohn disease, ulcerative colitis, infectious enterocolitis, nonspecific inflammatory disease, appendicitis.
2. Mechanical causes: Intestinal obstruction, gallstone ileus, intussusception, pyloric syndrome.
3. Tumoral causes: exophytic, ulcerated or annular types.
4. Ischemic causes: Pneumatosis intestinalis (refractile parietal foci)

SUMMARY

Ultrasound is a technique that should be considered in the diagnosis and management of some intestinal pathologies, being inexpensive, rapid, reproducible and which can be performed at the patient's bedside. In some pathologies ultrasound can be diagnostic while in other cases the findings allow a diagnostic approach, although the final diagnosis is made by another method.
**Key Imaging Findings That Result in Treatment Changes in the Management of Abdominal Tumors, Tipping Points**

**LL-GIE1264**  
Arash Anvari, MD  
Priyansh Kandakatla, MD  
Dushyant V Sahani, MD  
Raul N Uppot, MD

**PURPOSE/AIM**  
This educational poster will review staging system for all gastrointestinal tumors, and explain the role of imaging in their clinical management. We will show how key imaging findings “tipping points” can dictate changes in management and prognosis.

**CONTENT ORGANIZATION**  
1. Review the TNM staging system.  
2. Describing the concept of “tipping point” in clinical management of gastrointestinal tumors by imaging  
3. Assistimulate American Cancer Society cancer staging systems for all GI tumors and identifying points at which imaging findings change tumor stage, management, and prognosis.  
4. Gain understanding that specific imaging findings are critical for most tumor staging systems and that reporting of these specific findings is critical in changing staging and management for many GI abdominal tumors.  
5. Key questions to ask and why:  
   a. Pancreatic Adenocarcinoma  
   b. Hepatocellular Carcinoma  
   c. Cholangiocarcinoma  
   d. Gastric Adenocarcinoma  
   e. Small Bowel Carcinoma  
   f. Colorectal Carcinoma  
   g. Anal Cancer  
   h. Lymphoma

**SUMMARY**  
Imaging plays a central role in many staging systems in various gastrointestinal malignancies. This exhibition will emphasize on explaining the key critical imaging findings can dictate treatment choices and determine prognosis.

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**'Down the Hatch': Modified Barium Swallow Studies for the Radiologist: Performance and Evaluation**

**LL-GIE2686**  
Perry S Gerard, MD  
Swetha B Dasari, MD  
Joanne Sanchez, MS  
Ruri R Lee, MD  
Donatella Pavel, BS  
Zvi Lefkovitz, MD

**PURPOSE/AIM**  
The Modified Barium Swallow Study (MBSS) is a common examination for the assessment of dysphagia in both patients of all ages. MBSS exams are performed by speech pathologists with a radiologist. Many radiologists are unable to identify signs of abnormal swallowing. This exhibit will increase the understanding of the procedure and the pathology related to dysphagia. This will lead to more active participation in the examination by the radiologist and potentially improved detection of swallowing problems.

**CONTENT ORGANIZATION**  
Discuss the anatomy and normal and abnormal phases involved in the swallowing mechanism.  
We discuss the study and necessary collaboration between the radiologist and a speech-language pathologist.  
We discuss the fluoroscopic procedure performed during the examination.  
We talk about abnormal findings during the study which includes aspiration and penetration.  
We discuss the review of videotapes and reporting of the procedure

**SUMMARY**  
The Modified Barium Swallow Study is a dynamic assessment of swallowing performed in the Radiology department. The test is done under the direction of a Speech-Language Pathologist with a Radiologist operating the video fluoroscopy equipment. Radiologists and residents must understand the procedure and findings during the study, to collaborate and perform an adequate fluoroscopic study.

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**Low Tube Voltage CT with Iterative Reconstruction for the Diagnosis of Hepatocellular Carcinoma? HCC?**

**LL-GIE2687**  
Masahiro Okada, MD  
Hiroto Takahashi  
Yuki Kono, RT  
Tomoko Hyodo, MD  
Kazunari Ishii, MD  
Takamichi Murakami, MD, PhD *

**PURPOSE/AIM**  
Low tube voltage CT can reduce radiation exposure. But, careful reading is needed to diagnose HCC on low KV CT, because of the image noise. Our exhibit will illustrate HCC images with Iterative Reconstruction to overcome image noise, and highlight imaging-based diagnostic features.

**SUMMARY**  
Low tube voltage CT can reduce radiation exposure. But, careful reading is needed to diagnose HCC on low KV CT, because of the image noise. Our exhibit will illustrate HCC images with Iterative Reconstruction to overcome image noise, and highlight imaging-based diagnostic features.

---

**A Systematic Review of the Diagnosis and Staging of Hepatic Fibrosis with Non-Elastographic Imaging Techniques**

**LL-GIE2688**  
Kevin A Zand, MD  
Ajinkya S Desai, MBBS  
Claude B Sirlin, MD *

**PURPOSE/AIM**  
The purpose of this exhibit is to systematically review the:  
1. Rationale and key concepts of non-elastographic imaging techniques used for diagnosis and staging of hepatic fibrosis.  
2. Diagnostic performance of each technique using the data extracted from published studies.  
3. Advantages and disadvantages of each technique.
**Summary**

The major teaching points of this exhibit are:

1. There are multiple non-elastographic imaging techniques for diagnosis and staging of hepatic fibrosis.
2. These techniques assess liver morphology, texture, hepatocellular function, perfusion, and diffusion properties.
3. Many of these techniques are promising but still investigational.

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**Pancreatic Anomalies in Adults: Findings on CT and MR Imaging**

**LL-GIE2689**

Sandor A Joffe, MD  
Elina Zaretsky, MD, MA  
Marie I Rosenberg, MD  
Alexander C Kagen, MD *  
Michael Wayne, DO

**Purpose/Aim**

Congenital anomalies of the pancreas are occasionally identified in adults. Some of these anomalies may be symptomatic and some may be important in the event that the patient needs surgery in the region of the pancreas. The purpose of this exhibit is to demonstrate examples of these anomalies on CT and MRI and to discuss their clinical implications.

**Content Organization**

The cases will be presented in a quiz format. The discussion of each case will include the CT and MR imaging features, embryology, and clinical significance of each anomaly. The list of cases includes:

- Annular pancreas  
- Dorsal agenesis  
- Pancreas divisum  
- Ansa pancreatica  
- Portal annular pancreas

**Summary**

Congenital anomalies of the pancreas in adults may or may not be symptomatic and may have implications in surgical planning. Radiologists should be familiar with the imaging appearances of these anomalies in order to properly report them.

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**Applications of the Fast kVp Switching Dual Energy CT for Hepatopancreato-biliary Imaging**

**LL-GIE2690**

Tomoko Hyodo, MD  
Masahiro Okada, MD  
Masayuki Kudo, PhD, RT *  
Teruhito Mochizuki, MD  
Kazunari Ishii, MD  
Takamichi Murakami, MD, PhD *  
Masakatsu Tsurusaki, MD, PhD

**Purpose/Aim**

1. Demonstrate the clinical advantages and pitfalls of the virtual monochromatic imaging and material decomposition technique using fast kVp switching dual energy CT (DECT) in hepatopancreato-biliary imaging  
2. Discuss reducing radiation exposure at DECT

**Content Organization**

1. Principles of DECT  
2. Imaging characteristics necessary for image interpretation  
2a. Change of the lesion-to-organ contrast according to keV  
2b. Blooming effect in objects including iodine and metal  
3. Clinical applications  
3a. Optimization of keV in virtual monochromatic imaging for detecting low-contrast lesions  
3b. Material decomposition analyses: patency of artenosclerotic arteries, tumor ingrowth into a metal biliary stent  
3c. Quantification of iodine amount for evaluating therapeutic response of neoplasms  
3d. Reduction of iodine dose by using a low keV setting  
4. Strategies for radiation dose reduction  
4a. Automatic tube current modulation  
4b. Hybrid iterative reconstruction  
4c. Reducing a scan phase using virtual non-contrast imaging

**Summary**

The most advantages of DECT are that low contrast detectability can be improved after data acquisition, and iodine amount can be measured accurately. This exhibit will describe how to effectively use DECT for hepatopancreato-biliary imaging. Furthermore, we will discuss radiation dose reduction techniques in DECT.

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**Twists and Turns: MDCT of Volvulus and Internal Hernias, with Emphasis on the Role 2D Multiplanar Reconstructions for Diagnosis and Preoperative Characterization of Closed Loop Obstructions**

**LL-GIE2691**

Hazem Hawasli, MD  
Karen M Horton, MD  
Elliot K Fishman, MD *  
Pamela T Johnson, MD *

**Purpose/Aim**

Critical to CT training is the ability to identify closed loop small bowel obstruction. This exhibit reviews the CT findings in various entities that can cause closed loop obstruction, with an emphasis on delineating the location and cause using multiplanar reconstructions.

**Content Organization**
1. Protocol design
   - positive oral contrast vs water PO
   - when is dual (arterial and venous) phase IV contrast enhanced imaging indicated?
2. Recognize the appearance of closed loop small bowel obstruction on CT
   - CT findings that distinguish closed loop from non-closed loop obstructions
3. Gain an understanding of the CT findings in different forms of closed loop obstruction
   - internal hernia (paraduodenal, transmesenteric, iliac fossa)
   - volvulus (small bowel, colon)
   - adhesions or bands
4. Identify complications
   - ischemic bowel
   - perforation

SUMMARY
Closed loop small bowel obstruction is a surgical emergency, particularly in the setting of secondary complications of ischemic bowel or perforation. Volumetric display is crucial for identifying the location and cause of volvulus and internal hernias. This exhibit reviews factors that guide protocol design and demonstrates the range of CT appearances in surgically proven cases.

Benign and Malignant Duodenal Masses: Importance of CT Protocol Design

PURPOSE/AIM
A. To describe CT protocol design to optimize evaluation of duodenal masses
B. To present illustrative cases to gain awareness of the CT appearance of common duodenal masses
C. To improve radiologist's diagnostic accuracy in detecting and characterizing duodenal masses

CONTENT ORGANIZATION
A. CT technique with emphasis on the value of the use of a neutral oral contrast agent and dual phase imaging in the arterial and venous phases is presented. A brief review of duodenal anatomy will be presented; then, key diagnostic points will be highlighted in the discussion of each case. The cases presented include: B. Benign duodenal tumors - polyps, Brunner's gland hamartoma, lipoma, and duplication cyst. C. Malignant duodenal tumors - adenocarcinoma, gastrointestinal stromal tumor, neuroendocrine tumor, metastases.

SUMMARY
Duodenal masses may be missed unless attention is paid to CT protocol design. A tailored differential diagnosis can often be made based on imaging findings. For example, duodenal polyps can be missed without adequate distension of the lumen, and a neuroendocrine tumor can be suggested when a hypervascular lesion is seen. Localization of duodenal lesions assists referring clinicians when performing endoscopy and biopsy which is usually needed for a definitive diagnosis.

Role of Multidetector Computed Tomography (MDCT) in the Evaluation of Mucinous Tumors of Vermiform Appendix

PURPOSE/AIM
Describe the characteristic cross-sectional imaging features of appendiceal mucinous tumors and their complications.

CONTENT ORGANIZATION
MDCT features of mucinous appendiceal neoplasms: - pelvic cystic mass. - smooth impression on the medial aspect of the cecum. - curvilinear mural calcification

SUMMARY
MDCT is the modality of choice when an appendiceal mass is suspected. MDCT is useful in detecting appendiceal tumors and their associated complications. MDCT may suggest the specific diagnosis of mucinous appendiceal tumor when a cystic mass with curvilinear mural calcification is located in the medial wall of the cecum. Multiplanar capability of MDCT is very useful in demonstrating the relation of the tumor with the cecum and in differentiating mucinous appendiceal tumors from other cystic pelvic lesions.

When, How and Why We Should Suspect a Complicated Meckel's Diverticulum Imaging Features

PURPOSE/AIM
The purpose of this exhibit is:
- To recognize complicated Meckel's diverticulum as a possible etiology of acute abdominal pain.
- To identify and become familiar with both ultrasound imaging findings on MDCT as Meckel's diverticulum and its complications.

CONTENT ORGANIZATION
To review the embryology and anatomy of Meckel diverticulum. Describe complications of Meckel's diverticulum:
Formation of enteroliths
Gastrointestinal hemorrhage
Neoplasm

Review of imaging findings:

- US
- MDCT

Differential diagnosis. We report our experience in 10 years.

SUMMARY
The major teaching points of this exhibit are:

- Complicated Meckel's diverticulum is a condition to keep in mind in patients with acute abdominal pain.
- In children, the most common complication was gastrointestinal hemorrhage.
- Meckel's diverticulitis is the most common complication that occurred in the 10 years, coinciding with the literature.
- The ultrasound findings are nonspecific, CT remains the imaging technique of choice for the diagnosis of complicated Meckel's diverticulum.
- Technetium-99m pertechnetate scintigraphy is the modality of choice for evaluating pediatric patients.

Mesenteric Ischemia: Radiologic-pathologic Correlation

LL-GIE2695
David Bowden, MBBChir
Mark Arends
Sara S Upponi, MBBS

PURPOSE/AIM
The purpose of the exhibit is to: 1. Briefly review the pathophysiology of acute and chronic mesenteric ischemia
2. Description of the radiological manifestations, in addition to changes seen at histopathological analysis
3. Correlate imaging with histopathological findings to aid interpretation of the severity of mesenteric ischemia

CONTENT ORGANIZATION

- Review of the pathophysiology of mesenteric ischemia
- Multimodality illustration of the radiological findings encountered, with a focus on MDCT features
- Review of changes seen at histopathological analysis of resection specimens
- Description of radiologic/pathologic correlative features that may aid the radiologist, including recognition of pitfalls seen at imaging

SUMMARY
Major teaching points are:
1. Mesenteric ischemia has a high mortality and morbidity - its early recognition and intervention is known to be critical
2. Predicting severity based on imaging and non-imaging findings has presented significant challenges
3. Correlation of radiologic-pathologic changes may therefore provide objective tools that enable the radiologist to detect mesenteric ischaemia and support clinicians in key management decisions

Magnetic Resonance Elastography of Liver: Clinical Experience, Techniques and Challenges

LL-GIE2696
Raymond Lee, MSc
Gladys G Lo, MD
John K Chan, MBBChir
Wing Wa Li, MSc
Ka Man Chan, MSc
Betty Hung, BSc

PURPOSE/AIM
Magnetic Resonance Elastography (MRE) is a rapidly developing, non-invasive technique to assess the mechanical properties of tissue, which are affected by pathological disease processes such as fibrosis and tumors. Potential clinical applications in various parts of body were reported. Studies have indicated that MRE is a reliable alternative to invasive liver biopsy in diagnosis of liver fibrosis. The purpose of this exhibit is through cases, 3D illustrations and pictures to:
1. Discuss the principles, MRI techniques necessary for MRE of liver. 2. Review the necessary hardware and software. 3. Precautions when performing analysis and post-processing of MRE.

CONTENT ORGANIZATION
Introduction - Indications - Basic MRE protocol - Pros and cons of MRE versus other examinations Technical considerations - Positioning of the mechanical driver - Sequence for MRE - Parallel imaging
Precautions - Describe how the region of interest (ROI) can be drawn - Factors affecting the accuracy of MRE, eg. iron overload and respiratory artifact

SUMMARY
1. MRE is a non-invasive, accurate and reliable alternative to liver biopsy for the diagnosis and staging of hepatic fibrosis.
2. Understanding the principle and limitations of MRE techniques are critical for accurate measurement of hepatic stiffness.

KUB Quiz! 50 Shades of Grey, White, and Black

LL-GIE2697
Jerry T Loo, MD
Frank K Chen, MD
Miriam Romero, MD
Mittul Gulati, MD

PURPOSE/AIM
1. Review abdominal radiograph search pattern, which can be neglected with the increased prevalence of advanced imaging.
2. Present a range of abdominal radiograph pathology, with advanced imaging (ultrasound, CT, and MRI) correlates as needed.
3. Utilize interactive “quiz based” format.

CONTENT ORGANIZATION
Introduction - Indications - Basic MRE protocol - Pros and cons of MRE versus other examinations Technical considerations - Positioning of the mechanical driver - Sequence for MRE - Parallel imaging
Precautions - Describe how the region of interest (ROI) can be drawn - Factors affecting the accuracy of MRE, eg. iron overload and respiratory artifact

SUMMARY
1. MRE is a non-invasive, accurate and reliable alternative to liver biopsy for the diagnosis and staging of hepatic fibrosis.
2. Understanding the principle and limitations of MRE techniques are critical for accurate measurement of hepatic stiffness.
1. Introduction, overview quiz format, recommended search pattern.

2. Bowel gas patterns and abdominal organs
   - normal
   - localized and general ileus
   - small and large bowel obstruction
   - volvulus
   - organomegaly

3. Pathologic gas
   - free air
   - bowel wall pneumatosis
   - portal venous gas
   - emphysematous cholecystitis, pyelonephritis, and cystitis
   - retroperitoneal gas
   - pneumothorax
   - 4. Calculations
   - urethromembranes
   - cholelithiasis
   - chronic pancreatitis
   - lymph nodes

- vascular calcifications

4. Musculoskeletal
   - spine disease
   - sacroiliac joints
   - Organ displacement

5. Foreign bodies and iatrogenic devices, incorrect positioning
   - non-medical objects
   - contrast nephrotoxicity

SUMMARY

1. Review abdominal radiograph search pattern, as well as both commonly encountered and pathognomonic findings for a range of pathology.

2. Review advanced imaging correlates for conditions with diagnostic radiographic features and which may first be encountered on radiographs.

3. Utilize interactive, quiz based format.

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**Gastrointestinal and Mesenteric Manifestations of Hematologic Malignancies: Multidetector-row CT Findings**

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<tr>
<td>Kiyomi Furuya, MD</td>
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<td>Kotaro Yasumori, MD</td>
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<td>Seiichi Okamura, MD</td>
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<td>Seiya Momosaki, MD, PhD</td>
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<td>Toshiro Kuroiwa</td>
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<td>Masahir Sakai</td>
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<td>Akihiko Kutsuna</td>
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**PURPOSE/AIM**

1. To identify the various gastrointestinal (GI) and mesenteric manifestations in patients with hematologic malignancies, and to recognize those that are complications of therapy as well as those that result from the malignancy itself.

2. To demonstrate their multidetector-row CT (MDCT) findings. Pathological findings of actual cases will be also shown.

3. To assess the value of MDCT in making the correct diagnosis.

**CONTENT ORGANIZATION**

1. Clinical overview.

2. The cases presented comprise misty mesentery sign after chemotherapy, imaging results due to the original diseases themselves: sandwich sign, GI masses from a nonspecific mass to a mass with aneurysmal dilatation, a mass with intussusception, and diffuse mesenteric and peritoneal thickening; and images of complications of therapies: neutropenic colitis, opportunistic infections, pseudomembranous colitis and subsequent megacolon, graft versus host disease, GI perforation, peritoneal abscess, pneumatosis cystoides intestinalis, and uncontrollable GI bleeding.

3. Discussion

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**Complicated Necrotizing Pancreatitis: The Disrupted Pancreatic Duct**

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<tr>
<td>Kyuran A Choe, MD</td>
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<td>Vincent Koenigsknecht, MD</td>
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<td>Doan N Vu, MD</td>
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<td>Milton T Smith, MD</td>
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<td>Nathan Schmulewitz, MD *</td>
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<td>Stephen Kucera, MD</td>
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<td>Daniel Abbott, MD</td>
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<td>Jeffrey J Sussman, MD *</td>
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<td>Syed A Ahmad, MD</td>
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**PURPOSE/AIM**

The purpose of this exhibit is: Review the imaging findings that suggest the diagnosis of pancreatic duct disruption as a complication of necrotizing pancreatitis. Review the therapies utilized to manage and treat pancreatic duct disruption and their associated imaging findings.

**CONTENT ORGANIZATION**

Brief review of necrotizing pancreatitis and the imaging findings Imaging features in necrotizing pancreatitis that suggest / support the presence of a disruption of the pancreatic duct as a complication of necrotizing pancreatitis (CT, MRI, ERCP) Review of therapies utilized in management of pancreatic duct disruption (percutaneous drainage, ERCP duct drainage, surgical resection, surgical fistula jejunostomy)

**SUMMARY**

Major teaching points: Identify patterns of necrotizing pancreatitis and acute necrotic collections that suggest pancreatic duct disruption. Identify patterns of residual pancreatic tissue that suggest disconnected tissue due to duct disruption. Be knowledgeable about the management and therapy of pancreatic duct disruption. Be familiar with the imaging findings seen in the therapy and management of pancreatic duct disruption.

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**MRI Contrast in Abdominal Imaging: The Best and The Brightest!**

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<tr>
<td>Myles T Taffel, MD</td>
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<td>Sunny C Rhee, MD</td>
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<td>Shahriar Haji-Momenian, MD</td>
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<td>Paul Nikolaidis, MD</td>
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**Value of MR Imaging for Differential Diagnosis of Cystic Pancreatic Lesions**

**PURPOSE/AIM**
1. To review the imaging findings of cystic pancreatic lesions. 2. To determine useful MRI criteria for differential diagnosis of cystic pancreatic lesions. 3. To explain the utility of MRI rather than CT in the differential diagnosis of cystic pancreatic lesions.

**CONTENT ORGANIZATION**
- CT and MRI techniques of pancreas. Review of CT and MRI findings of cystic pancreatic lesions. Pseudocyst, Serous cystadenoma, Mucinous cystic neoplasm, IPMN, Solid pseudopapillary tumor, Cystic islet cell tumor, Lymphoepithelial cyst. Sample cases of utility of MRI in the differential diagnosis of MRI. Summary

**SUMMARY**
The major teaching points of this exhibit are: 1. MRI is more useful rather than CT in the differential diagnosis of small sized cystic pancreatic lesions and in the diagnosis of honeycomb type of serous cystadenoma, IPMN, and solid pseudopapillary tumor. 2. The awareness of the diagnostic limitations of CT are important for diagnosis and management of cystic pancreatic lesions.

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**Gastric Mesenchymal Tumors: Imaging and Pathologic Correlation**

**PURPOSE/AIM**
There are unusual gastric tumors originating in mesenchyma of the stomach wall. Mesenchymal origin gastric tumors are infrequent; however an accurate diagnosis is important to determine the type of tumor. This is because accurate diagnoses are helpful for providing the proper treatment and predicting prognosis. In this review, authors will demonstrate imaging findings and pathology of the mesenchymal tumors.

**CONTENT ORGANIZATION**
Recently, MDCT is useful for reformation of gastric tumors and helpful for accurate localization and also tumor characterization. gastrofiberscopy can be useful for direct visualization of the mass. Endoscopic ultrasonography can delineate tumor characterization. Understanding of various imaging findings and pathologic findings are important for the accurate diagnosis of mesenchymal tumors. Various kinds of mesenchymal tumor can be seen in the imaging studies, including: Gastrointestinal Stromal Tumor (GIST), Leiomyoma, Leiomyosarcoma, Schwannoma, Lipoma, Liposarcoma, Carcinoid tumor, Lymphoepithelioma-like carcinoma, Lymphoma, Bronchogenic cyst, Hemangioma, Lymphangioma, Glomus tumor, and Duplication cyst.

**SUMMARY**
Authors illustrate imaging findings of rare gastric tumors and pathologic correlation. A review of related literature is also included in this exhibition. It is helpful in the diagnosis of various gastric tumors.

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**Mimics of Abdominal Malignancies: How to Avoid**

**PURPOSE/AIM**
- Review mimics of malignancies due to congenital, infectious, inflammatory, and post-operative abnormalities
- Review artifacts that may mimic malignancies
- Provide strategies using clinical information, imaging findings, and further work-up as necessary to distinguish between malignancies and their mimics

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**Gastric Bypass and Banding Complications: An Imaging Guide**

**PURPOSE/AIM**
Objectives: 1) Learn the incidence of complications for gastric bypass and banding. 2) Review the imaging characteristics of gastric bypass and banding complications. 3) Understand various treatments used for bariatric complications.

**CONTENT ORGANIZATION**
1. Objectives
2. Gastric Bypass Complications
   - Incidence of Complications - Anastomotic Leak - Anastomotic Narrowing/Stricture - Degradation of Pouch Restriction - Gastro-gastric Fistula - SBO - Internal Hernia
3. Gastric Banding Complications - Incidence of Complications - Stomal Stenosis and Obstruction - Pouch Dilation - Slippage of Gastric Band - System Disconnections - Transmural Band Penetration

**SUMMARY**
Major Teaching Points: 1. Bariatric surgery is indicated for patients with morbid obesity, BMI > 40. 2. Anastomotic leak is a life threatening complication of gastric bypass that can occur in 5% of patients. 3. Rapid weight loss predisposes to formation of internal hernias from enlarging surgical mesenteric defects. 4. Two forms of pouch dilation for banding are: concentric and eccentric. 5. Anterior band slippage is suggested by a Phi angle < 4°, and posterior slippage with angle > 58°
Pancreatic Adenocarcinoma and PET/CT: Is This a Recurrence?

LL-GIE2705
Rachel Shields, MD
Luann T Jones, MD
John G Strang, MD
Hongju Son, MD
Savita Puri, MD, MPH

PURPOSE/AIM
1. Challenge the participant, in a case-based presentation, incorporating clinical data, to recognize and learn to differentiate CT and FDG-PET/CT (PET/CT) findings of typical post-surgical changes versus locally recurrent pancreatic adenocarcinoma. 2. Highlight cases which have shown the individual strengths and complementary nature of CT and PET/CT in restaging patients. 3. Illustrate limitations and potential pitfalls of CT and PET/CT while evaluating for locally recurrent disease.

CONTENT ORGANIZATION
1. Pathophysiology and epidemiology of pancreatic adenocarcinoma. 2. Current roles of CT and PET/CT in staging and restaging. 3. Image-based cases of post-surgical changes on CT and PET/CT which may mimic local recurrence. 4. Image-based cases of local disease recurrence which appear concordant and/or discordant on CT and PET/CT. 5. Imaging pitfalls in cases where disease recurrence was not initially suspected or was incorrectly interpreted on restaging exams. 6. Potential areas for improvement in imaging detection on follow up PET/CT and CT.

SUMMARY
The major teaching points are: 1. CT and PET/CT play complementary roles in restaging patients with pancreatic adenocarcinoma and must be interpreted in the clinical context. 2. There is an emerging role for the use of PET/CT in determining local disease recurrence.

Clues to Vascular Pathology on Noncontrast CT Scan

LL-GIE2706
Jennifer L Berkowitz, MD
Priya K Shah, MD
Gregory M Grimaldi, MD

PURPOSE/AIM
Evaluation of vascular pathology is limited on non-contrast CT. However, there are several important findings on non-contrast CT, which may alert the radiologist to important vascular pathology. We hope to demonstrate these key non-contrast CT imaging characteristics.

CONTENT ORGANIZATION
1. Evidence of venous thrombosis
   a. Hyperdense, expanded vessel
   b. Perivenous infiltration
2. Collateral Vessels (venous)
   a. Cross-Pelvic
   b. Chest Wall
   c. Intra-abdominal
   d. Shunts
3. Arterial Dissection
   a. Intimal flap
   b. Intramural hematoma
   c. Medial displacement of calcium
   d. Perivasculus infiltration
4. Evidence of AV Fistula, Aneurysm
5. Congenital venous anomalies associated with disease

SUMMARY
Non-contrast CT is routinely performed for certain indications such as renal stone disease and evaluation of suspected retroperitoneal hematoma. In addition, its utilization has increased in the inpatient setting where many patients are unable to receive intravenous contrast due to diminished renal function. The radiologist should be aware of key imaging findings on non-contrast CT, which may be indicative of vascular pathology.

Colloid Carcinoma of the Pancreas Associated with Intraductal Papillary Mucinous Neoplasm (IPMN): Spectrum of CT Appearance and Comparison with Conventional Ductal (Tubular) Adenocarcinoma

LL-GIE2707
Satomi Kawamoto, MD *
Siva P Raman, MD
Ralph H Hruban, MD
Elliot K Fishman, MD *

PURPOSE/AIM
1. Colloid carcinoma of the pancreas is an uncommon subtype of pancreatic adenocarcinoma, commonly found in association with intraductal papillary mucinous neoplasm (IPMN). 2. To discuss and illustrate spectrum of CT appearance of colloid carcinoma of the pancreas arising in association with IPMN. 3. To discuss and illustrate CT findings that may help to differentiate colloid carcinoma from conventional ductal (tubular) adenocarcinomas arising in association with IPMN.

CONTENT ORGANIZATION
1. Pathologic types of invasive carcinoma of the pancreas arising in association with IPMN and their clinical features. 2. Spectrum of CT appearance of colloid carcinoma of the pancreas arising from IPMN. 3. CT findings of other pathologic types of invasive adenocarcinoma (e.g. conventional ductal [tubular] adenocarcinoma) arising in association with IPMN. 4. CT findings that may help to differentiate colloid carcinoma from other cancer subtypes.

SUMMARY
1. Colloid carcinoma is a subtype of pancreatic adenocarcinoma that usually occurs in patients with IPMN. 2. CT is helpful to determine the subtype of associated invasive carcinoma arising from IPMN. 3. Colloid carcinoma can be associated with continuous dilatation of pancreatic ducts.
duct without separate soft tissue mass or abrupt cut-off of dilated pancreatic duct, with large cyst and mural nodule.

**CT Diagnosis of Gastroduodenal Ulcers: Imaging Findings with Endoscopic Correlation**

**PURPOSE/AIM**
1. Review the CT manifestations of gastroduodenal peptic ulcer disease.
2. Review the correlative endoscopic findings of gastroduodenal peptic ulcer disease.
3. Review the related complications of peptic ulcer disease including GI bleeding, perforation, and fistula formation.

**CONTENT ORGANIZATION**
- Case examples of CT findings of peptic ulcer disease with correlative endoscopic and pathologic findings
- Imaging of immediate and late complications including GI bleeding, perforation, and fistula formation
- Imaging of syndromes related to peptic ulcer disease including Zollinger Ellison syndrome
- Mimics of inflammatory disease

**SUMMARY**
1. Advances in CT technology have renewed interest in its use for evaluating the stomach/duodenum, and frequently patients with non-specific abdominal pain undergo CT imaging. As endoscopy is the primary tool used to evaluate gastroduodenal ulcer disease, it is important to correlate CT and endoscopic findings.
2. CT imaging findings of peptic ulcer disease include gastric or duodenal wall/fold thickening, submucosal edema, and deep ulceration with surrounding inflammatory change.
3. CT can be helpful in identifying complications of peptic ulcer disease including perforation and bleeding.

**Systematic and Theoretical Diagnosing Internal Hernias; How Do We Suspect Internal Hernia and Identify the Cause of Hernia in Patients without Typical Clinical Presentation**

**PURPOSE/AIM**
The purpose of this exhibit is
1. To show the stepwise approach to localize internal hernia and identify the cause of hernia
2. To review various cases of internal hernia in which many cases were difficult to suspect because of subtle or atypical clinical presentation

**CONTENT ORGANIZATION**
1. Breaking CT signs to suspect internal hernia
   - Atypical distribution of ascites
   - Localized mesenteric or bowel wall edema
   - Don’t misread; Diseases which mimic internal hernia
2. Diagnostic CT findings of internal hernia
   - Morphologic changes of the intestine at the hernial orifice
   - Morphologic changes of the mesenterium around the hernial orifice
3. The causative structures of hernial orifice
   - Fat band
   - Omentum
   - Fibrous band
   - Epiploic appendage
   - Adhesion
   - Congenital defect in mesentery and ligament

**SUMMARY**
The major teaching points of this exhibit are:
1. Ascites, mesenteric edema, and bowel-wall edema suggest the location of internal hernia.
2. A pair of localized intestinal narrowing and convergence of mesenteric vessels suggest the hernial orifice.
3. Mesenteric fat displacement and fibrous structures suggest the causal structure of the hernial orifice. The identification of the causal structure can help surgeon’s decision on the type of approach (open or laparoscopic surgery).

**CT of Gastrointestinal Tract Perforations: A Comprehensive Review**

**PURPOSE/AIM**
To present the causes for GI tract perforation at each site throughout the tract
To highlight CT imaging features that help to localize the perforation site
To review the patterns in difficult though surgically proven cases that can lead to prospective perforation site localization

**CONTENT ORGANIZATION**
1. Background on GI tract perforation and the importance of defining the cause 2. CT imaging of GI tract perforation by Site and Cause
   - Esophagus
   - Trauma
   - Boerhaave syndrome
   - Tumor
   - Foreign Body
   - Iatrogenic Stomach
   - Ulcer Disease
   - Tumor
   - Iatrogenic/Postsurgical dehiscence Small Bowel
   - Trauma
Acquired Diaphragmatic Hernias: Anatomic Review and Its Acute Complications: Cases Reports

LL-GIE2711
Carmen Rodriguez Pavon, MBBS
Ana Rodriguez Molina
Margarita Gonzalez Fernandez
Carolina Fernandez-Crehuet Serrano
Marta Atencia Ballesteros, MD
Ana Tapia Guerrero

PURPOSE/AIM
Review the anatomy and describe the types of acquired diaphragmatic hernias. Describe clinical and radiological manifestations of acquired diaphragmatic hernias and their acute complications with cases in our institution. Highlighting the contribution of CT in diagnosis and surgical approach.

CONTENT ORGANIZATION
Diaphragmatic hernias involve migration of abdominal structures into the chest through a defect in the diaphragm and divided into congenital and acquired.
The congenital hernias include Morgagni and Bochdalek hernias. We classify the acquired diaphragmatic hernias into traumatic hernias and hiatus hernia. The most important acute complications resulting from acquired diaphragmatic hernias include volvulus, incarceration or strangulation of stomach or herniated bowel loop and its consequences (ischemia, intestinal perforation or obstruction).

SUMMARY
Knowledge the anatomy of the diaphragm is essential to understand and diagnose different types of diaphragmatic hernias. CT is a very useful tool in type and location of the acquired hernia diagnosis and its acute complications, improving the management and treatment choice.

My Stomach Hurts! A Pictorial Review of Gastric Bypass Surgery and the Spectrum of Associated Complications

LL-GIE2712
Abigail V Berniker, MD
Mohammadreza Hayeri, MD
Stanley U Chan, MD
Justin E Mackey, MD

PURPOSE/AIM
This exhibit aims to:
- Illustrate the technique for Roux-en-Y gastric bypass surgery
- Review the normal postoperative anatomy
- Show the spectrum of postsurgical complications through a case-based, multimodality pictorial approach

CONTENT ORGANIZATION
- Overview/purpose
- Roux-en-Y gastric bypass
  - Surgical technique
  - Normal postoperative anatomy on multiple imaging modalities (Fluoroscopy, CT, MRI)
- Spectrum of postoperative complications through a case-based pictorial review
  - Anastomotic stricture
  - Anastomotic leak
  - Fluid collection (hematoma, seroma, abscess)
  - Fistula formation
  - Internal hernia
  - Bowel obstruction (simple, closed-loop)

SUMMARY
Bariatric surgery is an increasingly popular method of addressing the obesity epidemic. First introduced in 1967, the roux-en-Y gastric bypass procedure is the most common type of bariatric surgery. While it can yield significant weight loss, gastric bypass surgery can also lead to a host of immediate and delayed postoperative complications, some of which can be life-threatening if not treated urgently. Radiologists need to be familiar with the normal postoperative imaging appearance on various modalities in order to recognize the range of complications and expedite appropriate management.
**SUMMARY**

1. Magnetic resonance has a high detection accuracy of the causes of biliary-enteric anastomosis dysfunction.
2. The radiologist should be familiar with the diagnosis of the different causes of dysfunction: technical or anatomical factors, bile colonization with secondary stones and sludge, malignant and benign strictures, among others.
3. Late dysfunction of biliary-enteric anastomosis occurs in up to 8% of the patients that underwent surgery, of which 80% require percutaneous intervention and 20% require surgical remodeling.

---

**Caution: The Features of Various Gastric Lesions Tend to be Overlooked on T2WI MRI with a Negative Oral Contrast Agent**

**LL-GIE2714**

**PURPOSE/AIM**

Assessment of the gastric lumen by T2WI MRI with a negative oral contrast agent, such as during magnetic resonance cholangiopancreatography (MRCP), is associated with a blind spot, because the radiologist concentrates on the biliary tree and main pancreatic duct. The same is true for other examinations using negative oral agents.

**CONTENT ORGANIZATION**

1. Normal postoperative findings.
2. Useful studies: Clinical scenarios of biliary-enteric anastomosis dysfunction.
3. The usual suspects: Diagnostic imaging findings of dysfunction with Magnetic Resonance cholangiography, Computed Tomography and invasive (percutaneous or retrograde) Cholangiography.
4. Unusual imaging findings of biliary-enteric anastomosis dysfunction.
5. Role of the radiologist in the management and follow-up of dysfunction.

**SUMMARY**

1. We incidentally detected various gastric lesions on T2WI MRI with a negative oral contrast agent performed for the purpose of MRCP, liver MRI or kidney MRI, because administration of a negative oral contrast agent results in distension of the gastric lumen and decrease in the fluid signal. A clear understanding of the normal and abnormal findings of the gastric mucosa and submucosa on T2WI MRI with a negative oral contrast agent is essential to enable accurate diagnosis. Attention to gastric lesions on T2WI MRI with a negative oral agent could facilitate early and appropriate treatment.

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**Secretin-stimulated MR Pancreatography: The Exocrine Pancreas at Study**

**LL-GIE2715**

**PURPOSE/AIM**

To describe the role of Secretin-stimulated MR Pancreatography in several clinical situations ranging from anatomical variants to chronic pancreatitis focusing in the evaluation of morphological changes and exocrine pancreatic function

**CONTENT ORGANIZATION**

1. Study of anatomical variants (santorinicele, annular pancreas).
4. Diagnosis of acute pancreatitis complications in main pancreatic duct.
5. Detection of silent exocrine pancreatic insufficiency in Diabetes Mellitus II (DMII) considering the pancreatic disease as a global process based on a pilot study in 17 patients.

**SUMMARY**

1. Magnetic resonance has a high detection accuracy of the causes of biliary-enteric anastomosis dysfunction.
2. The radiologist should be familiar with the diagnosis of the different causes of dysfunction: technical or anatomical factors, bile colonization with secondary stones and sludge, malignant and benign strictures, among others.
3. Late dysfunction of biliary-enteric anastomosis occurs in up to 8% of the patients that underwent surgery, of which 80% require percutaneous intervention and 20% require surgical remodeling.

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**IgG4 Related Sclerosing Disease**

**LL-GIE2716**

**PURPOSE/AIM**

IgG4 related sclerosing disease is a recently recognized entity that consists of elevated serum IgG4 levels, extensive IgG-4-positive plasma cells, and lymphocytic infiltration in a variety of organ systems. The disease is most commonly associated with autoimmune pancreatitis. IgG4 related sclerosing disease can mimic malignancy and increasing awareness of this disease entity can help prevent unnecessary surgery.

**CONTENT ORGANIZATION**

The epidemiology, pathophysiology, and treatment of IgG4 related sclerosing disease will be reviewed. Imaging characteristics of autoimmune pancreatitis and additional extra-pancreatic manifestations including renal, biliary, retroperitoneal, and lung findings will be described. Pathologic correlation of IgG4 related sclerosing disease will also be demonstrated.

**SUMMARY**

Heightened awareness of IgG4 related sclerosing disease can improve patient management and prevent unnecessary surgery as this disease can be managed with steroids. At the end of the presentation, the reader should gain increased awareness and understanding of IgG4 related sclerosing disease and its imaging findings.
An Ending to Remember: Imaging Spectrum of Diseases of the Distal Ileum

**PURPOSE/AIM**

This exhibit aims to:

1. Highlight radiological manifestations of common/uncommon disease processes affecting the distal ileum, with pathological correlation.
2. Demonstrate how the differential can be narrowed through radiological evaluation (e.g., extent/degree of bowel wall thickening, stratified appearance and enhancement pattern) and associated findings (degree of adjacent mesenteric and extra-mural changes, nodal enlargement and adjacent organ abnormalities).

**CONTENT ORGANIZATION**

1. Normal anatomy and physiology
2. Pictorial review of the spectrum of distal ileal disease imaging findings on US and CT.

Examples to include the following:

1. **Inflammatory** (Crohn's disease, radiation enteritis, reactive)
2. **Infectious** (Campylobacter, tuberculosis)
3. **Autoimmune** (GVHD, scleroderma)
4. **Obstructive** (adhesions, bowel obstruction, gallstone ileus, DIOS)
5. **Malignant** (adenocarcinoma, carcinoid, GIST, lymphoma).
6. **Ischaemia** (SMA/SMV thrombosis, HSP)
7. **Miscellaneous** (pre-stenotic oedema, diverticulitis)

**SUMMARY**

At the end of this exhibit, the viewer should understand that:

1. Distal ileal disease is a common finding, which carries a wide differential diagnosis.
2. Through a multimodality radiological approach together with a thorough clinical history and examination a timely correct diagnosis can be obtained and appropriate treatment initiated.

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**MR Imaging of Non-adenocarcinoma Neoplastic Lesions of the Rectum**

**PURPOSE/AIM**

The purposes of this study are: 1. To identify the imaging aspects that suggest the possibility of a non-adenocarcinoma rectal lesion on MR; 2. To discuss the radiologic analysis of non-adenocarcinoma neoplastic rectal lesions in the multidisciplinary team with emphasis on TNM staging; 3. To illustrate the differential diagnosis of rectal lesions other than adenocarcinoma.

**CONTENT ORGANIZATION**

- Study protocol
- Review of typical aspects of adenocarcinoma: morphology (annular, semi-annular, polypoidal, mucinous), extramural spread through the invading edge, extramural venous invasion
- Other lesions: tips, morphologic aspects, pattern of spread, signal intensity
- GIST, lymphoma, squamous cell carcinoma, hemangioma, neuroendocrine tumor, mesenchymal tumors are the sample cases
- Important anatomic information for the surgeon

**SUMMARY**

MR is a robust tool to evaluate rectal adenocarcinoma. Well established criteria are useful to stage those patients. However, lesions other than adenocarcinoma may affect the rectum, and the TNM staging system of such lesions may differ. Even though most lesions are accessible to biopsies, atypical patterns on MRI may raise the suspicion of non-adenocarcinoma tumors, which may be confirmed by the pathologist. Therefore, the correct histologic diagnosis can aid the most appropriate treatment option.

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**MR Defecography for Dummies: A How-to Guide for Residents**

**PURPOSE/AIM**

Functional disorders of the pelvic floor often present with nonspecific symptoms that can undermine quality of life and pose a diagnostic dilemma for clinicians. Magnetic resonance (MR) imaging of defecation can display pelvic floor anatomy in multiple planes with excellent contrast resolution and provide dynamic assessment of functional pathology involving the pelvic floor and therefore have direct impact on patient management, all without exposure to ionizing radiation. We hope to educate residents by reviewing important aspects of MR defecography.

**CONTENT ORGANIZATION**

1. Discuss common indications for MR defecography.
2. Review the protocol for the procedure and provide information on image optimization techniques.
3. Discuss necessary sequences that are obtained and proper reporting method.
4. Review MRI normal anatomy of the pelvic floor.
5. Discuss quantification of pelvic floor descent and grading system in MR defecography.
6. Provide sample cases.

**SUMMARY**

MR is a valuable tool in the evaluation of functional disorders of the pelvic floor. We hope to provide a comprehensive review by highlighting the following: 1. Common indications 2. MR technique 3. Protocol and reporting method 4. Normal MR anatomy of the pelvic floor 5. MR evaluation of dynamic pelvic floor dysfunction.
A Pictorial Review of the Spectrum of MDCT Findings in Abdominal Tuberculosis

Richa Bansal, MD

PURPOSE/AIM
1. To review the gamut of imaging findings in abdominal tuberculosis on MDCT.
2. Discuss the clinical and imaging differential diagnosis.

CONTENT ORGANIZATION
In this exhibit we
1. Demonstrate the imaging findings in abdominal tuberculosis affecting the bowel, peritoneum, lymph nodes and solid organs.
2. Discuss the differential diagnosis and imaging mimics such as peritoneal carcinomatosis, lymphoma, inflammatory bowel disease and non tubercular peritonitis.
3. Role of image guided interventions.

SUMMARY
Tuberculosis is one of the most common disease entities affecting the Indian population. This exhibit aims at reviewing the spectrum of imaging findings on MDCT in abdominal tuberculosis involving various compartments. We also discuss the clinical and imaging masquerades of this disease process.

The Diagnostic Imaging Dilemmas of the Duodenal Neighborhood: A Pictorial Essay of Periduodenal Pathology

Abhijit Roychowdhury, MD
Rammohan Vadapalli, MD
Gulpa Subasinghe, FRCC
Abhinav Sriram S Vadapalli
Prerana P Agarwal, DMRD, MBBS
Sadiq Sikora, MS

PURPOSE/AIM
1. To highlight the Key anatomical landmarks in Duodenal and Periduodenal region. 2. To highlight the Common Congenital, Inflammatory conditions as well as Neoplastic masses in the Peri-duodenal region. 3. To demonstrate New Post Processing techniques like 3D Volume rendering, luminal and extra luminal navigation (perspective rendering) for optimal Surgeon friendly Visualization.

CONTENT ORGANIZATION
Content Organization: HRCT and High resolution MRI anatomy of Duodenum with key features. MR Hydrographic techniques Like MRCP and MR duodenography for Understanding the Key anatomical landmarks in the Peri-duodenal area. To enlist the Common and not so Common Pathologies of Duodenal Neighborhood. Discuss the characteristic diagnostic features with Key Points, Illustrative Clinical examples as well as Differential Diagnosis. Highlight of this exhibit will be the demonstration of New generation Image Post Processing techniques like Virtual CT/MR duodenoscopy with Navigation, Virtual Choledochoscopy and Extra Luminal Navigation for Laparoscopic Visualization.

SUMMARY
This Exhibit comprehensively discusses various Visualization approaches to Duodenum and its neighbourhood with Augmented Reality Display of various Common and Not so Common Pathologies.

Small Bowel Carcinoid Tumors: Finding Them before They Get to the Mesentery and Liver

Dhakshina M Ganeshan, MBBS, FRCC
Vikas Kundra, MD, PhD *
Melissa W Taggart, MD
John M Barlow, MD
David Bruining, MD *
Stephanie Hansel, MD *
Shiv Pruthi
Joel G Fletcher, MD *

PURPOSE/AIM
1. Review the epidemiology, molecular biology, pathology and natural history of carcinoid tumors of the small bowel. 2. Illustrate the multi-modality imaging spectrum of these tumors, with emphasis on clinical presentation and differential diagnosis. 3. Discuss the complementary role of cross-sectional enterography, capsule endoscopy, and balloon-assisted endoscopy in the diagnosis of small bowel carcinoid tumors

CONTENT ORGANIZATION
- Etiology and pathology, epidemiology, cytogenetics and molecular biology
- Clinical presentation and natural history
- Illustrate multimodality imaging features of primary small bowel carcinoids at cross-sectional (CT/MR enterography, PET/CT) and optical imaging (capsule and balloon assisted endoscopy), and provide an approach to the work up of these lesions
- Management and prognosis

SUMMARY
CT and MR enterography/ enteroclysis are increasingly used for identifying primary small bowel carcinoids prior to systemic spread, particularly in patients with obscure GI bleeding. In this poster, we review the spectrum of imaging appearances of these tumors, focusing on the appearance of the primary neoplasm in the small bowel, and also discuss the role of advanced endoscopic techniques such as capsule endoscopy and BAE in the diagnosis and management of these challenging tumors.

Cytoreductive Surgery with Heated Intraperitoneal Therapy (HIPC) for Peritoneal Malignancy: What Radiologists Need to Know

Hernan D Paez Rueda, MD
Daniel F Gomez Monroy, MD
Diego A Aguirre, MD
Oscar Rivero, MD

PURPOSE/AIM
The purpose of this exhibit is: 1. To review HIPC procedure and technique 2. To discuss common post surgical imaging findings and complications. 3. To describe the the most common sites were residual tumor tissue can be found on follow up studies.

CONTENT ORGANIZATION
1. The HIPC procedure
- Definition
- Indications and contraindications
2. Review of imaging findings (simple and contrast enhance CT)
   - Normal post surgical findings
   - Complications
   - Imaging follow up
   - Sites of residual disease
   - Sites of recurrent disease

3. Sample cases 4. Future directions and summary

SUMMARY
The mayor teaching points of this exhibit are: 1. HIPC consist of citoreductive surgery for peritoneal malignant disease assisted by the use of heated chemotherapy to enhance the therapeutic effect. 2. Normal post surgical imaging findings in HIPC include ascites, small pneumoperitoneum, and changes in the mesenteric fat. 3. Common complications of HIPC procedure include seroma, lymphangiomas, and abscess. 4. Common sites of residual tumoral disease are the lesser sac, subdiaphragmatic space, the small bowel and cul de sac.

What Radiology Residents Need to Know about Dermoids: A Pictorial Essay of Dermoids in the CNS, Chest, Abdomen, and Pelvis

LL-GIE2724
Nicholas L Henson, MD
Ryan B Peterson, MD
Anne Gill , MD
Courtney A Coursey, MD *
Talaat S Tadros, MD
Pardeep K Mittal, MD

PURPOSE/AIM
1. To review the pathology of dermoids/teratomas and variants
2. To review the characteristic imaging findings of dermoids
3. To show atypical cases of dermoids and variants occurring in the CNS, chest, abdomen, and pelvis

CONTENT ORGANIZATION
Classic dermoids are encountered routinely primarily as incidental findings within the female pelvis. Most of these dermoids are truly incidental lesions of little clinical consequence and reliably diagnosed on radiography and cross sectional imaging including US, CT, MR. However, Radiology residents should be aware of additional extrapelvic locations of dermoids as well as rare variants. For example dermoids may occur in atypical locations such as within the orbit. Furthermore, there are rare variants of dermoids such as struma ovarii composed predominantly or solely of mature thyroid tissue, which can be functional. Presented is a collection of cases illustrating dermoids in odd locations and rare variants for an educational review.
1. General pathology of dermoids
2. Review of characteristic imaging findings
3. Example cases
4. Summary

SUMMARY
1. Classic dermoids can be reliably diagnosed by characteristic imaging findings no matter where they arise. 2. Variant dermoids exist including struma ovarii and immature teratoma. 3. Consider dermoid as a diagnostic possibility when fat is present within a mass.

Imaging after Y-90 Liver Radioembolization - Expected Findings, Complications, and Pitfalls

LL-GIE2725
David S Heister, MD
Justin Tan, MD
Steven G Kikolski, MD *
Steven C Rose, MD *
Claude B Sirlin, MD *
Cynthia S Santillan, MD

PURPOSE/AIM
1. Yttrium-90 Radioembolization or SIRT
   - Indications
2. Treatment Response
   - Tumor size change
   - Enhancement and necrosis
   - PET and DWI
3. Expected Changes
   - Liver atrophy/hypertrophy
   - Peritumoral edema and hemorrhage
4. Complications
   - Biliary
   - Infectious
   - Radiation hepatitis
   - Non-target embolization
5. Imaging Pitfalls
   - Perfusion/enhancement abnormalities
   - Pseudolesions

SUMMARY
After viewing this exhibit, the reader will be able to identify the variety of post-treatment changes to the liver and potential complications. Most importantly, there are pitfalls in the interpretation of post-radioembolization imaging due to liver perfusion changes and parenchymal fibrosis. The reader should be able to identify these changes and distinguish them from true residual or progressive disease.

Rectal Cancer before and after Chemoradiotherapy: MR Assessment of Tumor Regression

LL-GIE2726
Joo Hee Kim
Joonseok Lim, MD
Eun-Suk Cho
Jeong-Sik Yu, MD
Jae-Joon Chung, MD

PURPOSE/AIM
Early Gallbladder Cancer: Multimodality Imaging Findings and the Identification of Subtle Lesions

Siva P Raman, MD
Elliot K Fishman, MD
Pamela T Johnson, MD
Charles H Mitchell, MD

PURPOSE/AIM
Many gallbladder cancers are incidentally identified during cholecystectomy when the patient undergoes surgery for other indications. With the improved image quality afforded by modern generation MDCT scanners, many of these early gallbladder malignancies may be visualized, provided that the radiologist is cognizant of the appearance of gallbladder cancers, and performs a dedicated evaluation of the gallbladder on every study utilizing multiplanar reformats and 3-D imaging.

CONTENT ORGANIZATION
- Background
- Clinical implications of identifying early gallbladder cancers prospectively
- Staging of gallbladder cancers
- Which gallbladder cancers are surgical candidates?
- Importance of utilizing MRI’s in evaluation of the gallbladder
- Case examples
- Conclusion

Gallbladder on every study utilizing multiplanar reformats and 3-D imaging.

visualized, provided that the radiologist is cognizant of the appearance of gallbladder cancers, and performs a dedicated evaluation of

Increasing Fundus of Knowledge: MRI of Stomach

Christine O Menias, MD
Amy K Hara, MD *
Kathryn J Fowler, MD *
Motoyo Yano, MD, PhD
Alvin C Silva, MD *
Kumaresan Sandrasegaran, MD *

PURPOSE/AIM
With growing trend toward non-radiation diagnostic studies, MRI is gaining acceptance as an imaging modality for the gastrointestinal tract. While the role of MRI is well established in small bowel pathologies, its role in imaging gastric disease is still evolving. This exhibit will present the MR characteristics of lesions and conditions that involve the stomach.

CONTENT ORGANIZATION
- Spectrum of MRI cases that demonstrate benign, malignant, vascular and iatrogenic conditions that affect the stomach will be presented.
- Cases included , but not limited to the following Gastrointestinal Stomal Tumors Polyposis syndromes Gastric Ulcers, Zollinger-Ellison Syndrome Gastric Varices Gastric Malignancies (adenocarcinoma, neuroendocrine tumors, metastases, leiomyosarcoma) Vascular anomalies (HHT) Post-operative changes (Gastric bypass, fundoplication, Angel-Chik prosthesis) Suggestions for protocols to evaluate the Stomach / Future directions

SUMMARY
Though MRI is not typically the primary imaging modality for evaluation of the stomach, understanding the MR characteristics of various benign and malignant gastric lesions is important, as many of these lesions maybe incidentally detected. This exhibit will augment the radiologist’s evaluation of the stomach on MR examinations.

Abdominal Imaging Using Fast KV Switch Dual Energy CT

Xiaohu Li, MD
Bin Liu, MD
Yu Yongqiang, MD

PURPOSE/AIM
Explain the principles of fast KV switch dual energy CT Understand how multi-energy spectral analysis can be performed. Highlight clinical applications for abdominal imaging

CONTENT ORGANIZATION
Dual energy implies the use of two X-rays sources at two different kV(80KV,140KV) levels simultaneously. The result is two spiral data sets acquired in a single scan providing information, which allows characterizing the imaged tissue or material. A new hardware based on rapid kV switching in 0.5ms is implied by General Electrics. The X-ray tube is capable of rapid kV(80KV,140KV), and mA modulation, switching from low to high energy at adjacent projections. This technology permits accurate material decomposition and monochromatic CT image display, enhancing image quality, spatial resolution, signal-to-noise ratio and decreases images artifacts. Abdominal clinical applications are wide, such as differentiation of Urinary stones, CT angiography with bone removal, beam hardening or metal artifacts with MARS reduction

SUMMARY
Dual Energy spectral CT is ready for routine clinical use. Several scan protocols offer additional clinically relevant information without additional contrast material or dose. Clinical applications are wide, not only for abdominal imaging, but also for thoracic, neurologic and musculoskeletal diagnosis

Early Gallbladder Cancer: Multimodality Imaging Findings and the Identification of Subtle Lesions

Charles H Mitchell, MD
Pamela T Johnson, MD *
Elliot K Fishman, MD *
Siva P Raman, MD

PURPOSE/AIM
Many gallbladder cancers are incidentally identified during cholecystectomy when the patient undergoes surgery for other indications. With the improved image quality afforded by modern generation MDCT scanners, many of these early gallbladder malignancies may be visualized, provided that the radiologist is cognizant of the appearance of gallbladder cancers, and performs a dedicated evaluation of the gallbladder on every study utilizing multiplanar reformats and 3-D imaging.

CONTENT ORGANIZATION
- Background
- Clinical implications of identifying early gallbladder cancers prospectively
- Staging of gallbladder cancers
- Which gallbladder cancers are surgical candidates?
- Importance of utilizing MRI’s in evaluation of the gallbladder
- Case examples
- Conclusion

Abdominal Imaging Using Fast KV Switch Dual Energy CT
SUMMARY
Early, unsuspected gallbladder cancers can be missed during routine evaluation of the abdomen on CT or MRI, largely because the radiologist does not focus on the gallbladder, does not recognize the salient abnormality because of its subtlety, or because the abnormality is difficult to visualize in the axial plane. As the cases in this exhibit illustrate, radiologists must perform a dedicated evaluation of the gallbladder on every CT or MRI, as well as utilize multiplanar reformats while searching for subtle abnormalities.

Magnetic Resonance Enterography Made Easy

 PURPOSE/AIM
- To discuss the role of ME enterography (MRE) in Crohn's disease.
- To Review MRE indications and technique for evaluation of Crohn's disease.
- To describe our protocol and experience.
- To show the main MRE imaging findings of Crohn's disease.
- To explain the usefulness of the dynamic contrast-enhanced curves.
- To show images of the fusion of sequences obtained without and after contrast administration and its potential usefulness.

CONTENT ORGANIZATION
- Learning objectives
- MRE protocol for evaluation of Crohn's disease
- MRE imaging findings of Crohn's disease
- New applications: dynamic contrast sequence curves and fusion images
- Our experience
- Summary
- References

SUMMARY
We present MRE as a simple and minimally invasive method. The most advantage of MRE is the precise location of active inflammatory disease without the disadvantages of using ionizing radiation. We show the use of cine-MRE sequences for evaluation of bowel stenosis and anastomotic strictures, the usefulness of the dynamic contrast-enhanced curves and the utility of fusion images in detection of Crohn's disease. MRE may be a powerful tool and provide referring physicians with information regarding inflammatory bowel disease and associated complications for planning an appropriate treatment.

MRI Evaluation of Perianal Fistula Made Easy

 PURPOSE/AIM
- To discuss the role of MRI in the assessment of perianal fistula.
- To review technique of perianal MRI.
- To describe our protocol and experience.
- To show the main MRI imaging findings.
- To explain the usefulness of the dynamic contrast-enhanced curves.

CONTENT ORGANIZATION
- Learning objectives
- MRI protocol for evaluation of perianal fistula
- MRI imaging findings
- New applications: dynamic contrast sequence curves
- Our experience
- Summary
- References

SUMMARY
We present MRI of perianal fistula as a simple and minimally invasive method. We show the advantages of MRI in the evaluation of perianal fistula as well as the use of the dynamic contrast-enhanced curves. MRI may be a powerful tool and provide surgeons with information regarding the fistula track and associated complications for planning an appropriate treatment.

Morphology and Invasiveness: How CT Colonography Can Help to Identify Which Lesions Need Treatment Soonest

 PURPOSE/AIM
To familiarize the audience with relatively inconspicuous, but relatively invasive non-polypoid lesions, and also how to differentiate them from low but shallow lesions whose clinical significance is minimal.

CONTENT ORGANIZATION
1. Quickly review the mechanisms of invasiveness in all shapes of lesions.
2. Introduce typical shapes and characteristics of rapidly invasive lesions, and how most quickly to distinguish them from clinically irrelevant phenomena.
3. Use 2D- and 3D- images in a quiz, case-study format to give all participants real hands-on experience at clinically effective diagnosis.
4. Answer all questions either on the spot, or in subsequent e-mails.

SUMMARY
In a ‘forest’ of non-polypoid (relatively flat, flat but stiff, depressed with a rim, and irregularly bumpy or nodular) lesions, practitioners will now be able to selectively identify which lesions need treatment first, and this will contribute to reducing mortality more effectively.
LL-GIE2736
Mark Wills, FRCR, MBBS
Antoni A Sergot, MBBS, BSc
Joel Dunn, MBBS
Minal C Jagtiani, MBBS, MD
Christopher Schelvan, MBBS

PURPOSE/AIM
The purpose of this exhibit is: 1. To illustrate the detailed anatomical information provided by Rectal MRI and correlate this to pathological specimens to show accuracy in staging. 2. To identify the tumour features assessed by MRI, and highlight how this influences patient management. 3. To match tumour features to the appropriate MRI sequences and demonstrate how good technique improves scan quality and diagnostic information.

CONTENT ORGANIZATION
Pathophysiology of colorectal carcinoma. When do surgeons operate for rectal carcinoma? Sample images of local staging on MR, correlated with histology. 5 key clinical questions the Radiologist needs to answer, and why. - Height of tumour above anal verge - T staging (including transmural venous invasion) - Mesorectal lymphadenopathy (N staging) - Circumferential resection margin (CRM) involvement - Disease outside the rectum. MR assessment of tumour response to neoadjuvant chemotherapy. Suggested MRI protocols for Rectal cancer.

SUMMARY
The main teaching points of this exhibition are 1. MR provides local staging for Rectal cancer 2. Rectal MR directs surgical management, in particular we have highlighted 5 key factors that the Radiologist must look for 3. MR allows assessment of disease response to treatment

Branch-type of Intraductal Papillary Mucinous Neoplasm of the Pancreas: CT and MRI Surveillance of Malignant Progression

LL-GIE2737
Kumiko Aita
Yasu Amano, MD
Tadashi Machida
Tetsuro Sekine
Masaki Tachi, MD, PhD
Minako Takeda
Shinichiro Kumita, MD

PURPOSE/AIM
The aim of this exhibit is to review CT and MRI findings of intraductal papillary mucinous neoplasm (IPMN) showing malignant progression and to show the clues for its early recognition. Radiologists will be able to diagnose IPMN with malignant progression after reviewing this presentation.

CONTENT ORGANIZATION
1) Sendai criteria for IPMN
2) CT and MRI findings additive to the criteria: i) rim enhancement of IPMN, ii) atrophy of the parenchyma close to IPMN, iii) cyst enlargement, iv) high attenuated cyst
3) CT and MRI images of IPMN associated with malignant progression: i) intraductal papillary mucinous carcinoma derived from IPMN, ii) ductal carcinoma within or close to IPMN, iii) ductal carcinoma distinct from IPMN
4) Summary

SUMMARY
The major teaching points of this exhibit are: 1. The entire pancreas as well as IPMN should be regularly and carefully observed using CT or MRI in patients with IPMN, 2. CT and MRI show enhancement of rim and solid components of IPMN, atrophy of the pancreas, cyst enlargement, high attenuated cyst, and development of pancreatic duct dilatation in IPMN with malignant progression, 3. These imaging signs should be recognized in addition to Sendai criteria, which may change the therapeutic strategies for IPMN.

Name That Belly Bulge: Abdominal Wall Hernias on CT

LL-GIE2738
Arti R Iyer, MD
Sandor A Joffe, MD
Mitchell B Horowitz, MD

PURPOSE/AIM
Abdominal wall hernias are frequently encountered on CT. Some of these hernias are commonly misclassified by radiologists. Other hernias are relatively rare. The purpose of this exhibit is to expose radiologists to a series of cases in order to improve the radiologist’s diagnostic accuracy when encountering abdominal wall hernias.

CONTENT ORGANIZATION
The cases will be presented in a quiz format. Important diagnostic points, particularly relating to anatomy, will be discussed to help distinguish different types of hernias. Types of hernias included are:
- Inguinal region hernias - indirect inguinal vs. direct inguinal vs. femoral hernias
- Anterolateral pelvic wall hernias - interparietal inguinal vs. spigelian vs. incisional hernias
- Anterior abdominal wall hernias - umbilical vs. ventral vs. incisional hernias
- Lumbar hernia
- Intercostal hernia

SUMMARY
Certain types of abdominal wall hernias may resemble other types of hernias. Knowledge of the anatomy of different types of abdominal hernias is essential to properly distinguish these hernias and arrive at an accurate diagnosis. In addition, knowledge of less common types of hernias is also helpful for accurate diagnosis.

Multi-detector CT-enterography with Iso-osmotic Mannitol as Oral Contrast in Evaluation of Small Bowel Crohnâ€™s Disease. Is It One Stop Technique?

LL-GIE2739
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Srikanth Moorthy, MD
Sreekumar K. P., MD
Rajesh R Kannan, MD
Ramachandran P. V., MD

PURPOSE/AIM
1. To describe the technique of multi-detector CT enterography using mannitol as oral neutral contrast.
2. To demonstrate the spectrum of lesions in small bowel crohn’s disease.
3. To classify lesions and its impact on management of patients. 4. To Compare CT/ MR-enterography and contrast enhanced ultrasound techniques.
MR Imaging Characteristics of Primary Liver Malignancies: A Practical Approach

**LL-GIE2740**  
Ryan B Peterson, MD  
Courtney A Coursey, MD *  
Volkan Adsay  
Burcu Saka, MD  
Pardeep K Mittal, MD  

**PURPOSE/AIM**  
- To review MRI protocols for evaluation of primary liver cancers  
- To review differential for primary liver malignancies including hepatocellular carcinoma, epitheloid hemangioendothelioma, hepatic angiosarcoma and cholangiocarcinoma with attentions on demographics, imaging characteristics on MRI and radiographic-pathologic correlation  
- To present primary liver cancer mimickers  

**CONTENT ORGANIZATION**  
- Briefly review MRI protocols for evaluation of focal liver lesions  
- Discussion of imaging characteristics of each lesion organized by primary lesions first, then by mimickers  
- Discuss need for further evaluation with biopsy, surgical intervention or radiographic follow up for each of the above lesions such as FNH, sclerosing hemangioma, confluent fibrosis and other secondary lesions e.g neuroendocrine etc  

**SUMMARY**  
Participants will know benefit of MRI over CT due to its superior soft tissue characterization and multi-planar capabilities as an excellent diagnostic tool in helping precise and detailed tumor characterization, as well as extent of disease. Understanding subtle imaging characteristics on MRI will help participants differentiate between primary liver malignancies and other benign mimickers. Radiologic-pathologic correlation will improve overall understanding of radiographic appearance.

Colorectal Cancer in Inflammatory Bowel Disease: MRI Imaging Features

**LL-GIE2741**  
Matthias Barral, MD  
Philippe A Soyer, MD, PhD  
Lora Hristova  
Mourad Boudiaf, MD  
Valerie Laurent, MD  
Philippe Marteau, MD, PhD  
Christine C Hoeffel, MD  

**PURPOSE/AIM**  
1. To describe the various presentations of inflammatory bowel disease (IBD)-related colorectal carcinoma (CCR) on MR imaging. 2. To discuss and illustrate MR imaging features that are helpful for CCR detection and characterization using imaging–pathologic correlation. 3. To suggest diagnostic algorithm based on imaging signs for accurate detection and characterization of suspicious MR findings.

**CONTENT ORGANIZATION**  
1. IBD-related CCR: epidemiology, histopathological and pathophysiological features. 2. Overview of specific MR imaging features of IBD-related CCR with pathological and surgical correlation. 3. Sample cases of various presentation of IBD related CCR at MR imaging.

**SUMMARY**  
The major teaching points are: 1. CCR in IBD displays three main patterns on MR imaging. 2. Knowledge of MR imaging findings of IBD-related CCR is critical to help suggest the diagnosis during follow-up of the disease. 3. Simple strategies based on the combination of imaging signs, clinical signs and endoscopic findings should improve diagnosis accuracy.

The Peritoneum: Two Sides of the Same Coin

**LL-GIE2742**  
Sara Santos-Magadan, MD  
Judith M Gonzalez, MD  
Teresa S Martin  
Covadonga Del Riego  
Luisa Taborda-Ramirez  
Daniel Castellon, MD  
Teresa Cuesta  
Carmen Carreira  

**PURPOSE/AIM**  
- To refresh the anatomical keys that allows the diagnosis related to peritoneal pathology.  
- Show an illustrated Multidetector Computed Tomography (MDCT) catalogue of the different diseases that can affect the peritoneum, with special emphasis on oncologic diseases.

**CONTENT ORGANIZATION**  
Primary tumors of the peritoneum are rare and its nomenclature is often confusing. Although the pathologic features of most primary and secondary neoplasms are non specific, knowledge of the typical image characteristics of these tumors may allow a precise diagnosis to be made. This 1st part intends to recall the basic anatomical clues for the study and analysis of peritoneal pathology. Primary tumors and tumor-like lesions of the peritoneum are reviewed on the second part. Some interesting cases of neoplastic diseases of the peritoneum (some very rare), diagnosed in our hospital and its characteristic CT features are shown.

**SUMMARY**
Knowledge of peritoneal spaces, ligaments and mesenteries is crucial to determine origin and extension of fluid collections before surgery or percutaneous drainage. It is also important for a correct stratification of neoplasms and associated complications.

MDCT is an important imaging modality for diagnosis and follow-up of neoplastic and nonneoplastic conditions of the peritoneum giving high anatomic resolution images.

Role of CT Colonography in the Evaluation of Inflammatory Bowel Disease in Patients with Incomplete Optical Colonoscopy

**Purpose/Aim**

Patients with Inflammatory Bowel Disease (IBD) have a higher risk of colon cancer. Unfortunately, different situations as the high rate of bowel stenosis, often precludes the diagnosis and follow up with optical colonoscopy (OC). The aim of this study is to illustrate the spectrum of CT colonography (CTC) findings in patients with IBD when a complete OC is not possible to perform.

**Content Organization**

- Description of the exploratory technique and multimodality pictorial review of the spectrum of typical IBD findings on CT colonography.
- CT and CTC images of our hospital.
- Show the value of TC colonography for monitoring IBD patients with impossibility of undergoes optical colonoscopy.
- Approach to the differential diagnosis, especially with neoplastic lesions.
- Tables.

**Summary**

CTC provides detailed information about colon endoluminal and extraluminal abnormalities. It could be a good alternative to OC in the detection of new lesions and monitoring of patients with IBD, when it cannot be completed.

The Imaging Patterns of Autoimmune Pancreatitis: A Comprehensive Review

**Purpose/Aim**

1. Describe epidemiology, histology, pathophysiology, natural history and treatment strategy of autoimmune pancreatitis (AIP) and its association with IgG4-related sclerosing disease.
2. Discuss multi-modality imaging spectrum of AIP presenting in various forms, with a discussion of diagnostic approach to such cases.
3. Briefly discuss systemic manifestations of IgG4-related sclerosing disease on multi-modality imaging.

**Content Organization**

A. Epidemiology, histology, pathophysiology, clinical features, and multi-specialty treatment strategy of AIP.
B. A brief discussion on IgG4-related sclerosing disease: Clinical and Radiological manifestations.
C. Multimodality imaging features (US, CT, MRI, and PET-CT) for diagnosis: a) Classic features; b) as a tumor mimicker with a focal mass and diagnostic clues on imaging; c) associated complications; d) Follow-up imaging strategy after steroid/immune therapy.

**Summary**

AIP is an autoimmune disorder, recognized as entity under broad spectrum of IgG4-related sclerosing disease. On imaging, AIP can manifest as focal FDG-avid enhancing/hypoenhancing mass leading to a diagnostic dilemma. The awareness of imaging pattern of AIP and signs to differentiate it from pancreatic malignancy among radiologists can help direct appropriate and timely management of patient, and avoid unnecessary procedures on such patients.

Capsule Endoscopy: Indications, Complications and Imaging Correlatives

**Purpose/Aim**

- Review endoscopic and imaging procedures commonly used to evaluate the small bowel
- Relate gastrointestinal societal indications for capsule endoscopy
- Depict the video capsule system and normal small bowel findings
- Illustrate multi-modality radiologic correlates to an atlas of pathologic findings at capsule endoscopy

**Content Organization**

- Imaging and Endoscopic techniques for small bowel investigation, including strengths and weakness
- The capsule endoscopy system
- Indications for capsule endoscopy
- Normal endoscopic small bowel appearance
- Multimodality comparisons in celiac disease, gastrointestinal bleeding, ulceration and neoplasms

**Summary**

Capsule endoscopy has expanded the small bowel imaging frontier beyond the capabilities of esophagogastroduodenoscopy and colonoscopy. It’s greater sensitivity to small bowel pathology is an advance over traditional radiologic imaging methods, but correlative knowledge can boost the radiologist’s perception and interpretation of subtle gastrointestinal findings in everyday practice.

Familiarity with capsule endoscopy guidelines can help triage patients to the most appropriate evaluation techniques, may decrease the use of low yield examinations and limit overall cost while increasing diagnostic accuracy.
Magnetic Resonance Enterography Assessment of Crohn's Disease: The Known and the Novel

Purpose/Aim
The purpose of this project is: 1. To explain the utility of magnetic resonance enterography (MRE) to assess Crohn's disease activity in comparison to computed tomography (CT) and ileocolonoscopy. 2. To review the MRE characteristics of active Crohn's disease using traditional sequences including T2-weighted and gadolinium-enhanced sequences, and newer sequences including diffusion-weighted imaging and cine TrueFISP imaging.

Content Organization
1. MR protocol and rationale
2. Assessment of Crohn's disease activity
3. Complications
4. Diffusion-weighted imaging
5. Cine TrueFISP and HASTE imaging - advantages and limitations
6. Pathological, endoscopy, and video capsule correlation
7. Dictation template
8. Comparison with CT enterography and ileoscopy

Summary
MR Enterography allows for the assessment of Crohn's disease activity and may substitute for other methods of assessment, including CT and ileocolonoscopy.

Role of Imaging in the Evaluation of Patients with Potentially Resectable Colorectal Cancer Liver Metastases: All the Radiologist Needs to Know

Purpose/Aim
To illustrate the role of imaging in the evaluation of patients with potentially resectable colorectal cancer liver metastases. To describe a practical approach for the evaluation of these patients depending on the stage of disease

Content Organization
Introduction and basic concepts
Patient selection (location and number of liver metastases). Initially resectable disease vs neoadjuvant chemotherapy. MDCT, MRI or PET CT? Evaluation of response after treatment with conventional chemotherapy or anti-angiogenic therapy.
Surgical planning Example cases using MDCT, MRI and PET-CT

Summary
Colorectal cancer is the third most common cancer in the world and liver metastases are the most common site of colorectal metastases. A multimodality approach with the combination of chemotherapy and surgical resection has considerably improved survival rates in these patients. Imaging plays an important role in the selection of the best therapeutic option and the modality to be used must be tailored to each patient and clinical situation.

Diagnosis of Pancreatic Lesions and Pseudolesions: Pearls, Pitfalls, and Challenges

Purpose/Aim
There are a variety of pitfalls in the evaluation of the pancreas on CT which can result in either failure to diagnose a true lesion, or alternatively, overdiagnosis of a 'pseudolesion' as a result of the failure to recognize common anatomic and congenital variants. Avoiding these mistakes is dependent on the utilization of proper CT technique, as well as the radiologist's recognition of common pitfalls.

Content Organization
• Importance of proper CT technique and pancreatic protocols
• Normal variants (i.e. fatty infiltration, pseudomass, etc.)
• Congenital abnormalities (i.e. annular pancreas, variations in pancreatic duct anatomy)
• Vascular pancreatic lesions (i.e. aneurysms, neuroendocrine tumors, and renal cell carcinoma metastases to the pancreas) - importance of arterial phase imaging
• Splenic pseudotumors - Accessory spleens
• Differentiating peripancreatic masses from pancreatic tumors
• Summary

Summary
• There are a wide variety of pitfalls in the evaluation of the pancreas on CT
• Normal variants and congenital anomalies can simulate pathology
• Dual-phase technique is necessary to recognize some abnormalities of the pancreas, and can be helpful in distinguishing true abnormalities from pseudolesions
• Many misinterpretations of pancreatic CT are most common at the level of the pancreatic head and tail.

Imaging of Choledochal Cysts

Purpose/Aim
To provide a comprehensive overview of the anatomy, pathogenesis, imaging and management of choledochal cysts.
Current Concepts in Angiogenesis in Hepatocellular Carcinoma with Focus on Pathophysiology, Targeted Therapy and Multi-modality Imaging Patterns

1. Describe genetics and pathophysiology of angiogenesis in relation to hepatocellular carcinoma (HCC).
2. Discuss basis of anti-angiogenesis therapy (Sorafenib) in HCC.
3. Review cross-sectional imaging spectrum of HCC and classify it based on vascularity of the tumor.
4. Review cross-sectional imaging of HCC after Sorafenib treatment as well as imaging patterns of toxicity related to Sorafenib.

HCC is typically a hypervascular tumor. Therefore, chemoembolization plays a major role in advanced cases. Sorafenib, an anti-angiogenesis drug has shown good results in treatment of advanced HCC in recent clinical trials. With increasing use of Sorafenib in advanced HCC, it is prudent to revisit basic understanding of angiogenesis pertaining to the HCC and the mechanism of Sorafenib action in this setting. It is important for radiologists to not only know the imaging patterns of HCC, but also be aware of response evaluation from as well toxicity profile of Sorafenib administration on imaging.

Compare and Contrast: A Review of Gadoxetic Acid with Emphasis on Its Pearls and Pitfalls

1. Review the physiology of gadoxetic acid and its expected appearance within hepatobiliary system
2. Discuss the applications of gadoxetic acid
3. Discuss the pitfalls of gadoxetic acid and potential solutions to help decrease unwanted imaging effects

Gadoxetic acid allows assessment of the hepatic parenchyma and vessels, liver lesions, and biliary system in one examination. This MRI contrast agent can also result in undesirable and confounding imaging effects, many of which are related to the hepatobiliary phase of enhancement. Knowledge of the applications and pitfalls of gadoxetic acid is imperative for accurate image interpretation.

Unraveling Colorectal Conference Conundrums Using MRI

1. The exhibit demonstrates the benefits of using MRI when developing multidisciplinary treatment plans for patients who have rectal cancer.
2. The sample cases are considered complex because tumors have unusual presentations, are difficult to stage, or require challenging surgeries.
3. We identify anatomic details on MRI images that influence the treatment approach.
We selected complex cases from weekly colorectal multidisciplinary planning conferences; the conferences facilitate collaboration between treating clinicians and radiologists prior to the initiation of treatment. While cases include input from medical oncology, surgical oncology, radiation therapy and pathology, we emphasize contributions of radiology for complex treatment decisions. Using high resolution angulation images, we define the extent of tumor invasion and clarify staging, and we provide critical information for surgical planning. We correlate images with operative findings and discuss the potential limitations of MRI in complex rectal cancer patients. We show new treatment options for rectal cancer.

SUMMARY
We show high resolution, thin slice MRI is a necessity for decision making in the multidisciplinary treatment of complex rectal cancer. We challenge radiologists and clinicians with puzzling cases.

**Histiocytic Disorders of the Gastrointestinal Tract: Imaging Perspective**

**LL-GIE2753**
Abhijit Sunnapwar, MD
Christine O Menias, MD
Vijayanadh Ojili, MD
Arpit M Nagar, MBBS
Erin Flaherty, MD
Maria Policarpio-Nicolas, MD

**PURPOSE/AIM**
Intestinal histiocytosis comprise of a variety of disorders. Since these disorders are rare with varies presentation, diagnosis can be challenging. Recent research has shed new light on pathophysiology of these disorders. Imaging plays a critical role in diagnosis.

**CONTENT ORGANIZATION**
- Introduction to various Histiocytic disorders (HD) affecting gastrointestinal tract (GIT)
- Classification of HD: Primary histiocytosis of uncertain origin (to include Erdheim-Chester disease), Primary histiocytosis of neoplastic origin, Reactive and infectious conditions (Xanthogranulomatous inflammation, Whipple’s disease etc.), Systemic disease with secondary involvement of GIT, Pigmented histiocytic aggregates (Barium granuloma)
- Clinical presentation and pathophysiology of HD
- Cross-sectional and MDCT imaging spectrum of HD

**SUMMARY**
Although thought to be a difficult diagnosis, HD can be diagnosed with the help of clinical history, imaging and histochemical and immunohistochemical markers. We present imaging perspective of this rare disease.

**Fecal Impaction: A Nuisance or Life-threatening Condition**

**LL-GIE2754**
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Kumaresan Sandrasegaran, MD
Sunita Dhanda, MD, FRCR
Fatih Akisik, MD
Temel Tirkes, MD
Christine O Menias, MD
Mark Tann, MD

**PURPOSE/AIM**
1. Understand the pathophysiology of stercoral colitis.
2. Review the imaging features, particularly those that proceed to colonic perforation
3. Emphasize the impact of early diagnosis of this entity on subsequent mortality.

**CONTENT ORGANIZATION**
1. Comorbidities associated with stercoral colitis, its pathophysiology and potential complications.
2. Spectrum of findings in stercoral colitis in 16 patients, with emphasis on early signs indicating impending colonic perforation
3. Correlation of clinical presentation and surgical pathology with imaging features of stercoral colitis in ill patients with multiple comorbidities.

**SUMMARY**
1. The correct preoperative diagnosis of stercoral perforation is made in only 10% of cases.
2. In a patient with colorectal fecal impaction, asymmetric rectal wall thickening or focal defect on the antimesocolonic side is worrisome for impending stercoral perforation.
3. Surgery without a preoperative diagnosis increases mortality from about 32% to 55%.

**Gastrointestinal MRI Pitfalls: Don't Get Burned**

**LL-GIE2755**
Lauren Moomjian, MD
Laura R Carucci, MD

**PURPOSE/AIM**
The purpose of this educational exhibit is to highlight the important MRI pitfalls in gastrointestinal imaging. As abdominal MRI is increasingly utilized, often as a first-line diagnostic study, potential limitations of MRI have become more apparent. We have found a number of areas in MRI of the gastrointestinal system where findings can be missed that may be much more readily identified on other imaging modalities.

**CONTENT ORGANIZATION**
- Discussion of the tailored approach to MRI and its limitations including incomplete visualization
- MRI artifacts -respiratory motion compromising the hepatic dome
- Bowel findings - internal hernia, staple line findings, diverticula, filling defects, GIST, cancer, IBD
- Complex / hemorrhagic collections
- Air in unexpected places- pneumoperitoneum, biliary air, pancreatitis, abscess
- Calcifications -chronic pancreatitis vs cancer, rectal hemangioma
- Mesenteric masses and carcinomatosis
- Abdominal wall findings

**SUMMARY**
Major teaching points of this exhibit:
A variety of imaging findings may be more difficult to diagnose with MRI as compared with other modalities. Directed MRI examinations are increasingly a first line study rather than a problem solving tool. Accurate diagnosis of GI findings on MRI relies upon knowledge of potential pitfalls and limitations.

**MR Imaging Patterns of Cholangiocarcinoma and Post-intervention Features: A Case-based Approach**

**LL-GIE2756**

Juan C Camacho  
Peter A Harri, MD  
Nima Kokabi, MD  
Pardeep K Mittal, MD

**PURPOSE/AIM**

1. Review basic principles of cholangiocarcinoma, common dissemination pathways and differential diagnosis.  
2. Discuss tumoral biology of cholangiocarcinoma and available image-guided therapies  
3. Discuss a practical approach to determine key diagnostic imaging findings and post-treatment changes following image-guided interventions under MR imaging

**CONTENT ORGANIZATION**

1. Basic presentation of colangiocarcinoma and differential diagnosis/mimics in a pattern-based approach.  
2. Role of imaging in treatment of cholangiocarcinoma, applying key concepts though a case presentation format

Important concepts are illustrated with schematic diagrams. Emphasis is placed on imaging pattern recognition and image guided therapies evaluation.

**SUMMARY**

Major teaching points are:

1. Cholangiocarcinoma may demonstrate typical imaging manifestations and common patterns of organ involvement, guiding diagnosis, and facilitating imaging follow up after therapy.  
2. MR imaging plays a key role for patient management, assessing therapy response and patient surveillance.  
3. Adequate knowledge of imaging appearance of cholangiocarcinoma before and after image-guided interventions is crucial for adequate diagnosis and surveillance.

**Objective Response Following Interventional Oncology Treatments: A Practical Approach to Apply Response Criteria through MR Imaging**

**LL-GIE2757**

Juan C Camacho  
Nima Kokabi, MD  
Eleza T Golden, MD  
Pardeep K Mittal, MD

**PURPOSE/AIM**

1. Describe response evaluation criteria for malignancies including WHO, EASL, RECIST and mRECIST with additional inclusion of DWI findings.  
2. Review imaging role and guidelines for follow up of patients with malignancies  
3. Discuss the importance of adequate imaging assessment after IO therapy.  
4. Discuss a practical approach for response evaluation of solid malignancies after IO therapy, recognizing common features after loco regional treatments and recurrence patterns

**CONTENT ORGANIZATION**

1. Basics principles and follow-up criteria following IO therapies  
2. Imaging Role: Review of imaging findings and algorithms for an adequate follow up after IO therapies  
3. Role of MR: when, what and which sequences are useful and how to interpret findings according to the delivered treatment  
4. Definition of response according to specific criteria following treatment (Case based presentation)

**SUMMARY**

The major teaching points are:

1. MR plays a key role in patients with abdominal malignancies regarding management and assessing therapy response  
2. Standardized follow-up criteria and imaging techniques should be applied to patients with abdominal malignancies, taking into account the primary neoplasm and current therapeutic strategies  
3. Adequate knowledge of follow-up criteria and its systematic use is crucial for adequate patient surveillance

**The Imaging Approach to Serum Tumor Markers: Correlation between Lab Values and Imaging Findings for Common Malignancies**

**LL-GIE2758**

Juan C Camacho  
Eleza T Golden, MD  
Pardeep K Mittal, MD

**PURPOSE/AIM**

1. Review basic principles of tumoral biomarkers and their main clinical applications  
2. Discuss the most frequently used tumoral biomarkers and correlate them with imaging patterns of malignancy  
3. Review a practical imaging approach to malignancies according to the results of serum biomarkers

**CONTENT ORGANIZATION**

1. Basics principles of the most common tumoral biomarkers  
2. Imaging Role: Review of imaging findings according to the serum biomarkers values, including differential diagnosis  
3. Correlation of serum biomarkers with imaging findings, including functional imaging (DWI, PET): From screening to diagnosis in a case-based presentation format

Important concepts are illustrated with schematic diagrams. Emphasis is placed on correlation between tumor biomarkers and imaging establishing a practical approach through imaging patterns
Major teaching points are:

1. Tumor biomarkers play a crucial role in detecting disease and assessing response to therapy.
2. Tumor markers have benefited some patients from the screening to the diagnosis phase, and the serum values correlate to the cross-sectional anatomic and functional imaging findings.
3. Basic knowledge of tumoral markers is crucial for adequate interpretation of oncologic imaging studies.

Cholangiocarcinoma: Recent Advances in Genetics, Molecular Biology and Imaging

LL-GIE2759
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PURPOSE/AIM
Recent advances in molecular biology and cytogenetics have revealed distinctive insight into the etiopathogenesis and biological behavior of cholangiocarcinoma (CC), which have important diagnostic, therapeutic, and prognostic implications. We present a comprehensive review of current advances in genetics, molecular biology and imaging.

CONTENT ORGANIZATION
1. Critical signaling pathways; p53 protein family; Dysregulation of CC cell growth and survival, aberrant gene expression, invasion and metastasis, and tumor microenvironment
2. MUC4 expression
3. Imaging: Staging, typical and atypical presentations, CC in Primary Sclerosing Cholangitis, Klatskin tumors, Mimics of CC
4. Role of imaging to select appropriate treatment
5. Photodynamic therapy combined with stenting
6. Role of IR
7. Advances in biology and cytogenetics, new treatment options and potential molecular targets

SUMMARY
Vast majority of CC clinically present at advanced stages and deemed unresectable. Conventional chemo-radiotherapy is usually ineffective in prolonging long-term survival; and no sensitive and specific tests exist for early diagnosis in high risk patients. Knowledge of molecular pathways of carcinogenesis of cholangiocarcinoma can permit appropriate selection of molecular targets to design customized treatment protocols and thereby permitting optimal patient management.

MR Defecography: How to Perform and How to Interpret?

LL-GIE2760
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Manjiri K Dighe, MD
Puneet Bhargava, MD
Jeffrey H Maki, MD, PhD *
Harpreet K Pannu, MD

PURPOSE/AIM
To provide the radiologist a comprehensive practical guide to understanding MR pelvic floor anatomy, the technique of MR defecography, and how to interpret pelvic floor pathology.

CONTENT ORGANIZATION
• Introduction and anatomy
  • Technique: Preparation and organ opacification, instructions to the patient, MR System and positioning, protocol and image orientation
  • MR Anatomy: Three compartments, pelvic muscles and ligaments
  • What surgeons want to know
  • Image analysis: Reference lines, anorectal angle, enteroceles, cystoceles, cervical prolapse, rectal intussusception, descending perineal syndrome, spastic pelvic floor syndrome, anal incontinence
• Tips and tricks
• Functional cine MRI versus fluoroscopy
• Pitfalls

SUMMARY
Pelvic floor dysfunction is a frequent problem, and effective imaging pre-operative assessment can greatly aid with surgical decision making and tailored management. MR defecography and functional pelvic MR imaging shows considerable promise and is emerging as the investigation of choice. Comprehensive knowledge of functional pelvic MR imaging and its interpretation is obligatory in this new era, and radiologists should be well versed in the technique of functional MR imaging and its interpretation.

Novel Application of MR Flow Evaluation: Direct Visualization of Pancreatic Juice Movement and Its Clinical Impact

LL-GIE2761
Reiji Sugita, MD

PURPOSE/AIM
1. To demonstrate the direct visualization method of pancreatic juice movement by MRI.
2. To illustrate clinical applications of direct visualization method of pancreatic juice movement by MRI.

CONTENT ORGANIZATION
1. Method of direct visualization of pancreatic juice movement by MRI.
2. Imaging and clinical applications (evaluation of chronic pancreatitis, detection of pancreatic juice reflux) by direct visualization of pancreatic juice movement by MRI.
3. Knowledge of anatomic variations and embryological development of biliary tree affecting pancreatic juice reflux, and essential knowledge for evaluation of chronic pancreatitis.
4. Case presentation compared with the pathology.

SUMMARY
The major teaching points of this exhibit are:

1. Direct visualization method of pancreatic juice movement by MRI is valuable in evaluating functional diagnosis of pancreatobiliary disease.
The Role of MRI in Preoperative Rectal Cancer Staging in Current Era: How to Use Volume Isotropic T2-Acquisiton (VISTA) and Pseudo-volumetric Diffusion Weighted Imaging (PV-DWI)

LL-GIE2762
Katsuhiro Nasu, MD, PhD
Manabu Minami, MD, PhD

PURPOSE/AIM
The precise preoperative staging for the rectal cancer is indispensable to make appropriate decision of the treatment strategy. In this presentation, we will introduce how to use the current technical advance, such as T2-Acquisiton (VISTA) and pseudo-volumetric diffusion weighted imaging (PV-DWI) in the local staging of the rectal cancer.

CONTENT ORGANIZATION
1. The correlation between depth invasion and lateral wall lymphnode metastasis
2. The current treatment strategy of rectal cancer; The issues which radiologists should know.
3. The actual employment of VISTA: The importance of multiplanar reconstruction
4. The convinient usage of DWI: DWI is cheat!

SUMMARY
The precise depth diagnosis of rectal cancer is the most important information to optimize the treatment strategy. From this point of view, VISTA and PV-DWI can play important role in the rectal cancer management.

1. PV-DWI can provide the information about the tumor configuration and direction of the tumor invasion
2. The proper multiplanar reconstruction of VISTA can visualize the correlation between the tumor, muscle layer and mesorectal fascia

Rectal Cancer MRI: Pitfalls of Restaging after Neoadjuvant Therapy

LL-GIE2763
Joseph W Owen, MD
Wendi A Owen, MD
Kathryn J Fowler, MD *
Vamsi R Narra, MD,FRCR *

PURPOSE/AIM
The purpose of the exhibit is:
1. Review the staging of rectal cancer with emphasis on MRI features that alter treatment.
2. Illustrate common errors in interpretation of initial staging MRI.
3. Discuss pitfalls in interpretation after neoadjuvant therapy.
4. Review developments in MRI that may improve specificity for restaging after neoadjuvant therapy.

CONTENT ORGANIZATION
Initial Staging
- Physical Exam/Exam Under Anesthesia
- Endorectal Ultrasound
- MRI
- PET

MRI Features of Rectal Cancer
- Tumor Extension
- Presence and Distribution of Lymph Nodes

Post-Neoadjuvant Therapy Pitfalls
- Post treatment inflammation / fibrosis
- Lymph node characteristics
- Diffusion restriction

Future Advances
- Diffusion Weighted Imaging
- Ultrasmall Superparamagnetic Iron Oxide
- PET/MRI

SUMMARY
The Major Teaching Points of the Exhibit include:
- The extention of lesion into mesorectal fat, fascia or adjacent organs is primary contribution of MRI to initial staging
- Size criteria are neither sensitive or specific for lymphadentopathy
- Overstaging is common after neoadjuvant therapy secondary to superimposed fibrosis and radiation-related inflammation
- Diffusion weight imaging, iron oxide contrast agents, and PET/MRI may increase post-neoadjuvant restaging specificity.

Gadoxetate Disodium Hepatobiliary Imaging: Pearls and Pitfalls

LL-GIE2764
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Kathryn J Fowler, MD *
Jay P Heiken, MD *
Guillermo Gonzalez-Araiza, MD
Melissa J McGettigan, MD
Wendi A Owen, MD
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PURPOSE/AIM
1. Review the pharmacokinetics and indications of Eovist
2. Demonstrate the challenges encountered in the clinical use of Eovist
Discuss the technical issues specific to Eovist
4. Outline future avenues for research

CONTENT ORGANIZATION
Background: Gadoextate Disodium (Eovist) is a hepatobiliary contrast agent with imaging properties that stem from uptake and subsequent biliary excretion by protein transporters predominately found in normal hepatocytes. 1. Receptors and Pharmacokinetic basis of Eovist imaging 2. Agent specific pitfalls •Altered enhancement patterns secondary to hepatic and renal dysfunction •Paradoxical uptake in malignant masses and infection •Pseudolesions in the setting of fibrosis •Misclassification of flash filling hemangiomas as metastatic lesions
4. Technical discussion of Eovist use
   • Protocol timing
   • Dosage
   • Avoidance of motion artifact on arterial phase imaging
5. Avenues for Eovist research
   • Hepatocellular carcinoma characterization
   • Pathologic Eovist uptake

SUMMARY
Eovist is a useful contrast agent for lesion characterization and metastatic work-up in the liver; however, there are several potential pitfalls and challenges associated with its use. Knowledge of these pitfalls is essential for optimization of imaging and avoidance of misinterpretation.

A Review of the Complications of Transjugular Intrahepatic Portosystemic Shunts (TIPSS)

PURPOSE/AIM
To guide the reader through the appearances of the complications of Transjugular Intrahepatic Portosystemic Shunts (TIPSS), with examples of intra procedural, early and late complications.

CONTENT ORGANIZATION
TIPSS procedures are becoming increasingly common, and with the projected increase in chronic liver disease this trend is unlikely to stop. Whilst the procedures themselves are limited to specialist centres, long term follow up and imaging may occur at smaller departments, and therefore there is a need for radiologists in these centres to be aware of the complications. We present a review of the complications we have encountered with TIPSS, dividing these into intraprocedural, early and late categories. We present fluoroscopic, MRI, CT and ultrasound images to demonstrate findings including haemorrhage, thrombosis (including acute Budd Chiari syndrome), stent occlusion, stenosis and closure, and distant complications such as encephalopathy.

SUMMARY
We review the appearances of the complications of TIPSS, with particular emphasis on those the general radiologist may encounter.

Time Is of the Essence: The Role of Time Resolved MRA for Body Imagers and Interventionalists

PURPOSE/AIM
1. Present an update on time resolved MRA (TR MRA) techniques (including various k space sharing techniques).
2. Illustrate how the vascular flow dynamics obtained with TR MRA enhances preprocedure planning.

CONTENT ORGANIZATION
Time Resolved MRA technical overview
   • K-space sharing techniques
   • Multiple volumetric datasets displayed as consecutive 3D maximum intensity projections
   • Sequence optimization
   • Use of blood pool contrast agents
   • Split bolus techniques

Applications for body imaging and intervention
   • Pelvic venous congestion
   • Renal vein compression syndrome
   • Stent graft evaluation
   • Mesenteric ischemia
   • Vascular malformations
   • Post-surgical complications

Preprocedure planning
   • Assess arterial supply and venous drainage
   • Assess flow dynamics
   • Plan Treatment

SUMMARY
The major teaching points include:
   • How to develop TR MRA protocols optimized to assess for specific vascular pathologies and implement them in your practice.
   • The value of TR MRA as a noninvasive procedure for obtaining vascular flow dynamics prior to intervention.

Extrapancreatic Perineural Invasion in Pancreatic Adenocarcinoma: Everything a Radiologist Needs to Know
PURPOSE/AIM
The purpose of this exhibit is to:
1. Review current staging classification of pancreatic adenocarcinoma
2. Pictorially review four pathways of extrapancreatic perineural spread
3. Demonstrate the utility of small field-of-view 3D volume rendered MDCT images in detecting perineural invasion

CONTENT ORGANIZATION
Epidemiology of pancreatic adenocarcinoma
Current staging classification and resectability criteria
Peri-pancreatic neural plexus anatomy review
Pathways of extrapancreatic perineural spread
- MDCT technique used for detection
- Case illustrations - MDCT 3D volume rendered images
Staging and management implications
Future work and conclusions

SUMMARY
The key teaching points of this exhibit are:
1. Pancreatic cancer continues to be associated with a high mortality rate.
2. Perineural invasion is known to contribute to overall poor prognosis and is associated with positive surgical margins and recurrence.
3. Small field-of-view 3D volume rendered MDCT is key in detecting perineural invasion.
4. Current staging classification does not account for perineural invasion which may impact future classification and management.

Let &Çeacute;ŽThe Hook Signï½; Get You Off the Hook: An Easy Way to Diagnose Indirect Inguinal Hernias with Axial Images in MDCT

PURPOSE/AIM
- To describe for the first time to our knowledge the inferior epigastric artery "hook sign"
- To propose "the hook sign" as an easy to use tool that helps to improve the groin hernias characterization

CONTENT ORGANIZATION
- Axial anatomy of the groin
- Types of groin hernias and review of the already known MDCT signs that allow us to classify groin hernias
- Describing 'the hook sign': the medial and posterior displacement of the proximal course of the inferior epigastric artery due to compression by an indirect inguinal hernia. Distally, the inferior epigastric artery returns to its normal lateral position. This convex course gives the vessel the appearance of a hook when seen on the axial plane
- Explaining 'the hook sign': why can it only be seen at indirect inguinal hernias?
- Tips and tricks
- Conclusion

SUMMARY
Classification of groin hernias is one of the most common yet one of the most difficult diagnostic challenges in abdominal imaging; it determines not only the clinical or surgical management but also, when needed, the correct surgical approach.
We propose "the hook sign" as a useful tool that helps not only the abdominal radiologist that has to deal with this problem on a daily basis, but also the general radiologist that every once in a while has to get off the hook.

Liver Lesions with 'Central Scar': It Is Not Always FNH

PURPOSE/AIM
To review liver lesions with 'central scar' and their imaging features
To understand what is a 'central scar' with radio-pathological correlations
To differentiate Focal Nodular Hyperplasia (FNH) from other lesions with late enhancement of the central element

CONTENT ORGANIZATION
Pathophysiology of the 'central scar' Review of liver lesions with 'central scar' with illustrative cases at US, CEUS, CT, MRI. Particular case of liver lesion with late enhancement of central element: differentiate FNH from other lesions

SUMMARY
'Central scar' is a process of tissue repair usually composed of inflammatory cells, vessels and fibrosis. It has been first described in FNH. Typical imaging findings of this scar are high signal intensity on T2-weighted MR images due to edema, visible arterial vessel and late enhancement of fibrosis. Giant hemangioma, adenoma, hepatocellular carcinoma, peripheral cholangiocarcinoma and liver metastases may have a central element and sometimes mimic FNH. Clinical context, imaging features of the lesion and liver should be carefully considered when analyzing the central element.

Utility of Gd-EOB-DTPA in the Non-cirrhotic Patient: Pearls and Pitfalls
1. Review the mechanism of action of Gd-EOB-DTPA, including unique imaging characteristics
2. Highlight the role of Gd-EOB-DTPA for hepatobiliary imaging in the non-cirrhotic patient population
3. Illustrate challenging cases in non-cirrhotic patients, where the use of Gd-EOB-DTPA may complicate interpretation relative to traditional extracellular contrast agents

CONTENT ORGANIZATION

1. Background – Liver imaging with Gd-EOB-DTPA versus traditional extracellular contrast agents
2. Review indications for using Gd-EOB-DTPA in the non-cirrhotic patient
3. Demonstrate the Gd-EOB-DTPA imaging findings of common and unusual liver lesions in the non-cirrhotic population, including metastasis, focal nodular hyperplasia, hepatic adenoma, hemangioma, and hepatic cyst.
4. Highlight common pitfalls of Gd-EOB-DTPA use in the non-cirrhotic liver with case examples, such as slow filling hemangioma and cholangiocarcinoma.

SUMMARY
Liver imaging with Gd-EOB-DTPA offers several benefits versus traditional extracellular contrast agents. However, there are unique technical and interpretive challenges posed by this contrast agent of which the radiologist should be aware. Through case examples, the practicing radiologist will become more familiar with Gd-EOB-DTPA, including benefits and drawbacks for hepatobiliary imaging in the non-cirrhotic patient.

The Wayward Colon: A CT Spectrum of Common and Uncommon Imaging Appearances of the Colon

LL-GIE2771
Chitra A Chandrasekhar , MBBS
Syed S Hashmi , MD
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PURPOSE/AIM
1. To demonstrate the variety of acute and non acute pathologic entities involving the colon commonly recognized on abdominal CT.
2. Correlate between plain film and CT findings in the spectrum of diseases that affect the colon.
3. Elucidate the classic as well as rare CT findings including infectious, inflammatory and non inflammatory processes including obstructions and neoplasia.

CONTENT ORGANIZATION
The colon has a very significant and unique role to play in the diagnosis of abdominal pain. Systemic and non systemic infectious and inflammatory processes involve the colon with very pertinent and characteristic presentations including “Aunt Minnies” recognized on abdominal CTs. The availability of reformats in the coronal and sagittal planes has ensured that the radiologist can “run” the colon as surely as the surgeon does in the OR.

This exhibit will provide a very systematic approach to evaluating the colon and show the features and classic signs of presentation of diseases of the colon.

SUMMARY
With the increasing use of abdominal CT, several disease entities involving the colon have been easily recognized. While previously the diagnoses did not assess the entire thickness of the colon or the surrounding mesenteric involvement, CT has enabled us to study the transmural and extramural extent of disease process and therefore help plan surgical approach.

Imaging of Polypoid Lesions of the Gallbladder: Spectrum of Disease with Pathologic Correlation

LL-GIE2772
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Kumaresan Sandrasegaran , MD
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PURPOSE/AIM
1. To review the spectrum of polypoid lesions of the gallbladder on US, CT and MR imaging and show pathologic correlation
2. To discuss salient features that may help guide in offering a differential
3. Discuss management options

CONTENT ORGANIZATION
Imaging spectrum of polypoid lesions of the gallbladder on US and MRI will be discussed with pathologic correlation

Cases include, but are not limited to the following: Cholesterol polyps Polypoid mucosal folds Non-calcified stones

Hyperplastic polyps
Sludge balls
Focal Adenomyomatosis
Chronic cholecystitis
Adenomas
Gallbladder adenocarcinoma
Melanoma
Metastases Discussion on the clinical implications for management for each of these lesions

SUMMARY
Polypoid lesions of the gallbladder represents a wide spectrum of findings and includes true polypoid neoplasms such as benign adenomas or adenocarcinomas and non-neoplastic polyps such as cholesterol polyps, inflammatory polyps, or adenomyomatous hyperplasia. Most polypoid gallbladder lesions are incidentally found to be benign lesions, but rarely, some can be malignant or premalignant neoplasms. This review will illustrate the salient features of polypoid lesions and their implications for management.

Heterotopic Pancreas: Imaging Features, Pathological Correlations, and Mimickers

LL-GIE2773
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Seong Ho Park , MD
Ah Young Kim , MD
Hyun Kwon Ha , MD

PURPOSE/AIM
The purpose of this exhibit is: 1. To present the broad spectrum of imaging features of heterotopic pancreas in various organs including the stomach, duodenum, jejunum, ileum, and mediastinum, and their pathological correlations on the basis of our experience with 340 pathology-proven cases during the past 13 years
2. To present characteristic imaging features of heterotopic pancreas which can be helpful to differentiate it from mimickers

CONTENT ORGANIZATION
1. Imaging features of heterotopic pancreas and pathological correlations
Imaging of Iatrogenic Complications of the Gastrointestinal Tract: When Drugs, Scopes, Probes, and Robots Go Bad

LL-GIE2774
Christine O Menias, MD
Vincent M Melnick, MD
Perry J Pickhardt, MD *
Meghan G Lubner, MD *
Douglas S Katz, MD
Gabriela Gayer, MD
Sanjeev Bhalla, MD

PURPOSE/AIM
• To review and illustrate the spectrum of Iatrogenic complications of the GI tract and their implications for patient management, with an emphasis on the role of CT for accurate and timely diagnosis

CONTENT ORGANIZATION
• Complications related to medications:
  • ACE-inhibitor induced angioedema
  • Bowel hematoma related to anticoagulation
  • Pseudomembranous colitis related to antibiotics
  • Chemotherapy-induced enteritis, pneumatosis
  • Radiation-induced enteritis
  • Complications related to endoscopy
  • Colonic perforation related to optical colonoscopy
  • Duodenal perforation related to ERCP
  • Intestinal stent-related perforation
  • Complications related to minimally-invasive procedures
    • Perforation related to laparoscopic procedures
    • Perforation related to robotic procedures
    • Ulceration related to non-targeted liver therapies
    • Lap band-related gastric erosion

SUMMARY
Iatrogenic conditions of the GI tract can be related to treatment effects from medications, from radiation, and following a host of endoscopic and other 'minimally invasive' procedures. Knowledge of not only the potential complications that can arise but also of the imaging features, and role of CT in accurate and timely diagnosis of injury to the intestinal tract in particular, is crucial to directing appropriate management. This exhibit will review these potential complications.

Imaging of Porto-systemic Venous Routes in Patients with Hepatic Cirrhosis

LL-GIE2775
Luca Saba, MD
Giovanni M Argiolas, MD
Carlo Nicola De Cecco, MD
Eugenio A Genovese, MD
Michele Di Martino
Carlo Catalano, MD

PURPOSE/AIM
In patients with hepatic cirrhosis the development of portosystemic venous anastomoses is quite common. An important site of portosystemic venous anastomoses is around the umbilicus, clinically named the Cruveilheir-Baumgarten syndrome. The purpose of this exhibit is 1) To understand the physiopathology of the portosystemic venous anastomoses. 2) To review the current indications for performing CT Angiography 3) To learn the CT technical parameters to be used 4) To show which post-processing techniques can be used and their indications.

CONTENT ORGANIZATION
1) Physiopathology of the portosystemic venous anastomoses, 2) Comparison of different imaging modalities : Sonography, CT and MR. 3) Current indications for performing hepatic CT Angiography underlining radiation exposure, cost and diagnostic efficacy. 4) CT technical parameters to be used, as well as the correct delay time, concentration and volume of contrast material. 5) Post-processing techniques and their indications.

SUMMARY
The development of portosystemic venous anastomoses is a common condition in patients suffering hepatic cirrhosis, moreover in these patients the caliber of paraumbilical veins increase. CT angiography give a clear visualization of these anastomose particular by using MIP and VR methods that precisely demonstrate vessel course, spatial relationship and collateral routes.

Autoimmune Diseases of the Abdomen- Radiology of the Different 'itis'

LL-GIE2776
Anitha James, MBBS
Sai Man Mung

PURPOSE/AIM
Discuss and demonstrate the various autoimmune diseases of the abdomen involving different organs including the following:

- Pancreas
- Biliary tree
- Liver
- Mesentery
- Retroperitoneum and other abdominal organs involved by IgG4 related sclerosing disease
This exhibit will discuss and demonstrate the computed tomography and magnetic resonance imaging finding of the various autoimmune disorders affecting abdominal organs as follows:

1. IgG4-related sclerosing disease including pancreatic and extrapancreatic manifestations in the abdomen
2. Primary sclerosing cholangitis
3. Primary biliary cirrhosis
4. Autoimmune hepatitis
5. Sclerosing mesenteritis and panniculitis
6. Mesenteric vasculitis in lupus

**SUMMARY**

Autoimmune diseases are usually a diagnosis of exclusion. However certain entities like autoimmune pancreatitis have pathognomonic imaging findings which can help make the diagnosis without further invasive procedures. As most of these diseases are treatable by steroids and immune therapy, recognising the radiological pattern is very important. Combination of serum markers, radiology and clinical course can clinch the diagnosis without histology in some cases and occasionally when histology is equivocal. Imaging is also very useful in follow up and monitoring treatment response.

**Diffusion Weighted Imaging for Characterising Focal Lesions of the Liver and Pancreas- Helpful or Overrated? My Experiences**

**LL-GIE2777**

**Anitha James**, MBBS

**PURPOSE/AIM**

Illustrate and discuss the Diffusion Weighted Imaging (DWI) and Apparent Diffusion Coefficient (ADC) of focal lesions of the liver and pancreas as follows:

- Infections and inflammatory lesions
- Benign neoplasms
- Malignant neoplasms - solid and cystic

**CONTENT ORGANIZATION**

This exhibit will depict and discuss the following

1. Liver abscesses, cholangitis and focal hepatitis
2. Benign liver lesions such as hemangioma and focal nodular hyperplasia
3. Malignant liver lesions - primary and secondary
4. Focal inflammatory lesions of the pancreas including focal autoimmune pancreatitis
5. Benign pancreatic neoplasms such as IPMN
6. Malignant pancreatic tumours

**SUMMARY**

DWI is well established in neuroimaging and gives great quality images. In the abdomen the role is increasing but less widely used. The image quality suffers from respiratory movement artefacts especially in the upper abdomen; so liver and pancreatic application depend on patient cooperation and skill of the MR technician. However diffusion is a great adjunct to conventional MR especially in lesion detection. It also helps in lesion characterisation, but the radiologist has to be aware of its limitations. This exhibit will demonstrate our experiences in DWI of the liver and pancreas with examples of increased value in lesion detection and characterisation.

**Pre-operative Imaging of Hilar Cholangiocarcinoma: What the Surgeon Wants to Know**

**LL-GIE2778**

**Leonardo P Marcal**, MD
**Gaiane M Rauch**, MD, PhD
**Harmeet Kaur**, MD
**Wai C Foo**, MD
**Evelyne M Loyer**, MD *

**PURPOSE/AIM**

To review the resectability criteria for Hilar cholangiocarcinoma and how cross-sectional imaging impacts surgical planning. To review the hepatic hilar anatomy, biliary and vascular variants that impact surgical planning, and the Bismuth-Corlette classification. The structured reporting for the pre-operative assessment of hilar cholangiocarcinoma.

**CONTENT ORGANIZATION**

1. Hilar Biliary Anatomy
2. Resectability Criteria for Extrahepatic Cholangiocarcinoma
3. Biliary and vascular variants that impact surgical planning
4. Bismuth-Corlette Classification of Hilar Cholangiocarcinoma
5. Staging of Hilar Cholangiocarcinoma
6. Imaging Technique and Protocol
7. Structured reporting for the preoperative assessment of Hilar Cholangiocarcinoma

**SUMMARY**

The major teaching points of this exhibit are:

1. The role of imaging in the preoperative evaluation of Hilar Cholangiocarcinoma.
2. The resectability criteria for Hilar Cholangiocarcinoma and how biliary and vascular variants impact surgical planning
3. The key elements that must be addressed in the Radiology report emphasizing a structured reporting format

**Acute Pancreatitis: What the Interventional Radiologist Can Do?**

**LL-GIE2779**

**Shivanand R Gamanagatti**, MBBS, MD
**Pramod Garg**, MBBS, MD
**Arun K Gupta**, MBBS, MD

**PURPOSE/AIM**

1. To illustrate imaging appearances of various pancreatitis related complications
2. To demonstrate the role of percutaneous as well as endovascular interventional procedures performed in the management of acute pancreatitis

**CONTENT ORGANIZATION**

1. Various imaging appearances of local and remote complications of pancreatitis • Necrosis • Pseudocysts • Abscesses • Fluid collections
2. Venous and arterial complications • Venous thrombosis • Pseudoaneurysms
3. Angiographic appearances of various pseudoaneurysms
4. **...**
Pancreatitis causes a spectrum of local, venous and arterial vascular complications. Imaging and interventional radiology plays vital role in the management of pancreatitis associated complications. Computed tomography (CT) is preferred for guiding percutaneous pancreatic interventional procedures and endovascular coiling is the treatment of choice for management of pseudoaneurysms.

**SUMMARY**

Pancreatitis causes a spectrum of local, venous and arterial vascular complications. Imaging and interventional radiology plays vital role in the management of pancreatitis associated complications. Computed tomography (CT) is preferred for guiding percutaneous pancreatic interventional procedures and endovascular coiling is the treatment of choice for management of pseudoaneurysms.

**Pearls and Pitfall in Bowel Imaging on FDG PET-CT Imaging**

**LL-GIE2780**

Jann Yee Chin, MBChir, MRCP  
Charlotte F Longman, MBChB, MRCS  
Jonathan D Colledge, MBChB, BSc  
Wade Gayed, MBBS  
Hikmat Jan, MD, MBChB  
Arman Parsai, MD

**PURPOSE/AIM**

**CONTENT ORGANIZATION**

**SUMMARY**

By the end of the review, the viewer should: 1. Understand the basic principles of FDG PET-CT 2. On FDG PET-CT:  
  i. Understand the normal physiological uptake distribution in the bowel  
  ii. Be able to identify benign and malignant bowel pathology  
  iii. Gain an appreciation of the pitfalls

**How to Elucidate the Ambiguous Appearances of Liver Metastasis on FDG PET/CT and MRI**

**LL-GIE2781**

Charlotte F Longman, MBChB, MRCS  
Wade Gayed, MBBS  
Jann Yee Chin, MBChir, MRCP  
Jonathan D Colledge, MBChB, BSc  
Teresa Szyszko, MSc, MRCS  
Arman Parsai, MD

**PURPOSE/AIM**

**CONTENT ORGANIZATION**

**SUMMARY**

By the end of the review, the viewer should: 1. Appreciate the importance of early accurate diagnosis of liver metastases in the optimisation of patient management  
  2. Understand the radiological appearances and utility of the novel imaging techniques (PET/CT and Diffusion/Perfusion MRI) in detecting and diagnosing liver metastatic deposits  
  3. Be familiar with the pitfalls of diagnosing and differentiating liver metastases

**Liver Involvement of Female Genital Pathologies: Spectrum of Imaging Finding**

**LL-GIE2782**

Sophie Beranger-Gibert  
Maxime Ronot, MD  
Matthieu Lagadec, MD  
Isabelle Boulay-Coletta, MD  
Erick Petit, MD  
Marc Zins, MD  
Valerie Vilgrain, MD

**PURPOSE/AIM**

1. To describe the imaging features associated with the liver involvement in a variety of female genital pathologies  
2. To focus on the different imaging patterns of the liver involvement  
3. To review the clinical implications and consequences

**CONTENT ORGANIZATION**

1. Anatomical considerations  
   - Liver is distant from the female genital organs  
   - but related to them: peritoneum and vessels  
2. Imaging findings of the 4 main involvement patterns  
   - Extrahepatic: peritoneal carcinomatosis of genital cancers  
   - Capsule of Glisson: endometriosis, Fitz-Hugh-Curtis syndrome, subcapsular hematomas, HELLP syndrome  
   - Parenchyma: metastases and abscesses  
   - Vessels: uterine leiomyomatosis with vascular extension  
3. Illustration of cases  
4. General overview on the clinical consequences on the patient management

**SUMMARY**

The liver is rarely involved in the spectrum of genital affections, mainly because of its distant position in the peritoneal cavity. However, vessels and peritoneum can constitute indirect anatomical links. As a consequence, the liver can be involved either via the peritoneum (carcinomatosis and Glisson capsule affections), or the liver vessels (hematogeneous dissemination of genital malignant and infectious processes, and the uterine leiomyomatosis with vascular extension). The clinical consequences mainly depend on the primary affection

**Liver Metastases: Functional MR as a One-Stop-Shop Imaging Modality**

**LL-GIE2783**

Carolina P Peixoto, MD  
Joana Fagundes Pinto, MD  
Romulo Varella, MD  
Natalia Sabaneff, MD  
Mauricio B Aranha  
Leonardo K Bittencourt, MD, MSc
In patients with primary extrahepatic malignancies it is essential to accurately detect liver metastases, because liver involvement usually implies important changes in the management and prognosis. The purpose of this study is to discuss the conventional and functional techniques based on MRI, with emphasis in advanced techniques for the detection and characterization of liver metastases.

**Purpose/Aim**

1. To illustrate favorable and unfavorable MR imaging findings to predict prognosis of hepatocellular carcinoma (HCC)
2. To discuss the clinical implication of MR findings of HCC and correlate it with biologic behavior

**Content Organization**

1. Treatment options for HCC based on the Barcelona Clinic Liver Cancer staging system
2. Review the various imaging modalities used to evaluate toxic megacolon/colitis, focusing on plain radiographs and CT appearances
3. Illustrate imaging examples and key imaging features of toxic megacolon/colitis, radiographs, MDCT and Scintigraphy

**Summary**

1. MR imaging can be used not only for non-invasive diagnosis but also for predicting tumor biology.
2. The favorable findings on MRI are small size, encapsulation, intratumoral fat, homogeneous arterial enhancement, high ADC value, hyperintensity on hepatobiliary phases. The unfavorable findings are large size, non-smooth margin, low ADC value, hypointensity on hepatobiliary phases.
3. MR imaging findings may be used as imaging biomarker in patients with HCC.

**Imaging of Toxic Megacolon/Colitis: What Radiologists Can't Miss**

**LL-GIE2785**

**Hee-Jun Kang**
**Jun Wang**, BSc
**Charlotte J Yong-Hing**, MD, FRCP
c
**Sarah A Barrett**, MBCh
**Savvas Nicolaou**, MD

**Purpose/Aim**

1. Overview of the etiology, risk factors and treatment of toxic megacolon/colitis
2. Review the various imaging modalities used to evaluate toxic megacolon/colitis, focusing on plain radiographs and CT appearances
3. Illustrate imaging examples and key imaging features of toxic megacolon/colitis, radiographs, MDCT and Scintigraphy

**Content Organization**

1. Plain abdominal radiograph can be critical for the diagnosis of toxic megacolon as they are commonly the initial imaging modality
2. There are several key characteristic features of toxic colitis/ megacolon that can help diagnose it on a plain radiograph
3. With developing CT technology, it may be of value in identifying one of the common cause of toxic megacolon: C. difficile colitis and IBD

**The Treatment Response of Hepatocellular Carcinoma: Evaluation with Imaging Biomarkers**

**LL-GIE2786**

**Yuko Nakamura**, MD
**Toru Higaki**, PhD
**Fuminari Tatsugami**
**Shuji Date**
**Akira Taniguchi**, RT*
**Kazuo Awai**, MD*

**Purpose/Aim**

The purpose of this exhibit is to:
1. Overview current treatment options for hepatocellular carcinoma (HCC)
2. Describe the role of imaging biomarkers for HCC
3. Compare the suitability of CT, MRI, and PET/CT as imaging biomarkers for evaluating the treatment response
4. Demonstrate utility of perfusion CT as imaging biomarkers for evaluating the treatment response

**Content Organization**

1. Treatment options for HCC based on the Barcelona Clinic Liver Cancer staging system
2. Characteristics of CT, MRI, and PET/CT as imaging biomarkers for HCC
3. Optimal use of imaging biomarker for evaluating treatment responses
4. Tips for evaluating therapeutic effects with imaging biomarkers
5. Promising imaging biomarkers for HCC-Perfusion CT-

SUMMARY
Radiologists should be cognizant of the suitability of CT, MRI, and PET/CT as imaging biomarkers for evaluating the treatment response of HCC. We demonstrate how to avoid inherent pitfalls in the evaluation of treatment responses using imaging biomarkers. We will also discuss the utility of perfusion CT as promising imaging biomarkers for evaluation of treatment responses of HCC.

Imaging Evolution: Magnetic Resonance Imaging of Inflammatory Bowel Disease and Its Various Complications

LL-GIE2787
Shannon N Hill , MD
Marae B Shewmaker , MD
Pardeep K Mittal , MD
Courtney A Coursey , MD *

PURPOSE/AIM
- To demonstrate MRI findings of inflammatory bowel disease, its commonly associated findings, conditions that mimic IBD, and its diverse complications.
- To educate participants about the extensive array of MRI findings of IBD. Imaging will focus on the characteristic findings for an accurate and confident diagnosis of inflammatory bowel disease.

CONTENT ORGANIZATION
- Review the pathophysiology of inflammatory bowel disease.
- Provide a differential diagnosis for inflammation of the GI tract based on the predominant imaging patterns and commonly associated findings.
- Illustrate MRI findings of various complications, including malignancy, bowel perforation, stricture, bowel obstruction, intussusception, abscess, and various fistulae.
- Review the MRI protocols to ensure the ideal imaging of IBD, including emphasis on fat suppression and utilizing the spectral adiabatic inversion recovery (SPAIR) technique.

SUMMARY
Given its high rate of accuracy and lack of ionizing radiation, MRI is rapidly becoming the preferred modality to image patients with suspected or known inflammatory bowel disease. It is imperative that radiologists are familiar with the typical appearance of IBD and its complications. Distinctive imaging characteristics enable the accurate diagnosis of IBD, its commonly associated findings, and various pathologies that can mimic IBD.

Abdominal Complications after Allogeneic Hematopoietic Stem-cell Transplantation

LL-GIE2788
Rocio Carreno-Gonzalez , ARRT
Sonia Clare L-Loaiza , MD
Josefa Vicente-Romo
Maria Mar Molinero-Casares

PURPOSE/AIM
To review the abdominal complications after allogeneic transplant hematopoietic stem cell.
To establish a differential diagnosis for radiologic findings combining clinical factors and the point of time during the posttransplantation course.
To establish a radio-pathological correlation.

CONTENT ORGANIZATION
We reviewed 42 abdominal complications of a serie of 27 patients undergoing allogeneic transplant during the last year.
The complications were included into two periods: early complications (days 0-100) and late complications (after100 days). The abdominal complications found were: intestinal and hepatic graft-versus-host disease, infections (bacterial, viral or fungal), hepatic veno-occlusive disease, drug-induced disease, neutropenic colitis and hemorrhagic cystitis .
The most of the patients were studied by ultrasound, computed tomography and endoscopy with biopsy.
We describe the radiological signs of each disease and the clinical-radio-pathologic correlation.

SUMMARY
Abdominal complications of transplant patients are frequent. Radiological evaluation is essential for timely diagnosis of these complications to reduce patient morbidity and mortality. The point of time during the posttransplantation course and to establish a clinical-radio-pathological are useful keys to approximate the diagnosis.

Chronic Constipation - Is There a Role for Dynamic MR-imaging?

LL-GIE2789
Ulrike I Attenberger , MD *
John N Morelli , MD
Stefan O Schoenberg , MD, PhD *

PURPOSE/AIM
Chronic Constipation (COP) is a common problem in the Western world, mainly affecting young, slender women. There are numerous causative factors, which can be subdivided into three major groups: slow transit constipation, outlet and mechanical obstruction. Until now, no commonly available diagnostic procedure has achieved adequate accuracy at diagnosing these conditions. However, due to the possibility for combined morphologic and functional assessments, MRI may play an important role. The purpose of this educational exhibit is to explain causative factors for COP, to illustrate common diagnostic procedures, and to highlight the potential role dynamic MR imaging may play therein.

CONTENT ORGANIZATION
Underlying factors in chronic constipation - Slow transit constipation - Outlet obstruction - Mechanical obstruction Common diagnostic procedures - Gut transit time estimation by radiopaque markers - Whole-gut scintigraphy - Defecography Functional MRI - Detection of intraabdominal adhesions - Assessment of large bowel motility - Dynamic pelvic floor imaging

SUMMARY
Stuck in a Dead-end: An Organized Approach to Cecal Pathologies

LL-GIE2790
Shavitr Mahendiran , MD
Jay G Hochsztein , MD
IMAGING OF ECTOPIC SPLENIC TISSUE

Shane D Smith, MD
Suzanne L Palmer, MD
Rola Saouaf, MD
Thomas J Learch, MD

1. Knowledge of characteristic CT findings of cecal volvulus and cecal bascule is essential to differentiate them from bowel obstruction. 2. Key features of peritoneal and omental findings help to discriminate inflammatory bowel diseases between each other and other colitides. 3. Extent of mural involvement and paracecal findings aid in distinguishing cecal malignancy from regional inflammatory changes.

SUMMARY
1. We have shown a representative pictorial review of commonly encountered presacral abnormalities. 2. Demonstration of the pertinent imaging features as imaged with MRI, CT, and ultrasound depending on the specific case. 3. This will be useful for all levels of radiology education and specialty that can be used a practical reference when evaluating diseases centered at the presacral space.

THE SPECTRUM OF DIGESTIVE PNEUMATOSIS

Filipe Caseiro Alves, MD
Joao R Inacio, MD
Helena Tavares De Sousa, MD
Paulo Donato, MD, PhD

1. The purpose of this exhibit is: 1. To review the spectrum of underlying causes and pathological theories concerning the presence of gas within the wall of different segments of the digestive tract. 2. To illustrate the spectrum of imaging findings of pneumatosis involving the small and large intestine, stomach, and esophagus. 3. To suggest a mixed theory and a combined designation of “digestive pneumatosis”, to describe the presence of gas in intestinal, gastric, and esophageal wall.

CONTENT ORGANIZATION
1. Underlying causes, pathological theories (mechanical, bacterial, and pulmonary), and proposed mixed theory. 2. Selected cases of intestinal, gastric and esophageal pneumatosis, with different etiologies and severity grades, using a multimodality approach. 3. Correlation between features of intestinal, gastric and esophageal pneumatosis, leading to the proposed combined designation: “digestive pneumatosis”. 4. Conclusions.

SUMMARY
Major teaching points: 1. Pneumatosis is not an entity, but a radiological sign. 2. There is a wide spectrum of underlying causes, pathological theories, segments involved, imaging findings and severity. 3. The term “digestive pneumatosis” should be used to describe all cases of gas within the wall of the digestive tract.

IMAGING OF ECTOPIC SPLENIC TISSUE

Filipe Caseiro Alves, MD

1. To understand underlying mechanisms concerning the presence of splenic tissue in an ectopic location. 2. To display imaging findings of several entities characterized by the evidence of ectopic splenic tissue. 3. To know how to use imaging methods to achieve a correct diagnosis.

CONTENT ORGANIZATION
1. Splenic embryology. 2. Imaging features of normal splenic tissue in ultrasound, MDCT, MRL, and nuclear medicine studies, with emphasis in post-contrast and functional behavior. 3. Selected cases of: accessory spleen; splenosis; splenogonadal fusion; wandering spleen; and polysplenia, explored with a multimodality approach. 4. Conclusion.

SUMMARY
Major teaching points: 1. Splenic tissue has unique features in imaging studies. 2. There is a lot of congenital and acquired conditions in which splenic tissue may be seen in an ectopic location. 3. Multimodality imaging plays a key role for its recognition and characterization, potentially avoiding more aggressive diagnostic methods.
**Fluoroscopically Guided Balloon Dilatation of Esophageal Strictures in Children: How I Do It**

**PURPOSE/AIM**
To describe the technique of fluoroscopically guided esophageal balloon dilatation (EBD),
To discuss the advantages and complications of fluoroscopically guided dilatation.

**CONTENT ORGANIZATION**
Between January 2002 and December 2012, we have performed 530 EBD sessions to treat a multitude of disorders including caustic in 60 cases, acid peptic in 13 cases, anastomotic strictures secondary to surgical repair of esophageal atresia in 15 cases, megaesophagus in 10 cases and epidermolysis in 2 cases. Esophageal dilatation was performed under general anesthesia in all cases. Every session was done in five steps: (A) the first step consists to identify the stenosis on the pre-procedural esophagogram, (B) Then, guide wire is advanced under fluoroscopic control across the lesion, (C) Balloon catheter is advanced over the wire and balloon is centered on the lesion, (D) Balloon of variable diameters and lengths is inflated by radial force, repeatedly if necessary, (E) Finally, post-procedural esophagogram is performed. Esophageal perforation was observed in only 2 cases and treated conservatively.

**SUMMARY**
Repeated fluoroscopically guided balloon dilatation of esophageal strictures can be done successfully and safely with minimal rate of complications.

**Mysteries to Be Solved in the Ileocecal Area: Tricks to Reach a Correct Diagnosis**

**PURPOSE/AIM**
The structures of the ileocecal region (cecum, ileocecal valve, terminal ileum and appendix) can be affected in many pathological processes, common in clinical practice. The disease may involve only one of the structures, several of them simultaneously or be part of a generalized process. The purpose of the exhibition is to know the normal anatomy of the ileocecal region and its anatomic variants, and review the spectrum of diseases that affect this region.

**CONTENT ORGANIZATION**
1. Normal anatomy and the most typical variants. 2. Pathophysiology. 3. Differential diagnosis: appendicitis, lipomatous infiltration of ileocecal valve, mesenteric adenitis, colon carcinoma, Crohn disease, infectious ileocolitis, carcinoid tumors, cecal diverticulitis, appendiceal tumors, cecal volvulus, appendix mucocoele, typhlitis. 4. Diagnostic imaging: US, CT, MRI, and more. 5. Clinical presentation and imaging findings in each pathology. 6. Tips to get the correct diagnosis. 7. Diagnostic pitfalls in ileocecal pathology.

**SUMMARY**
The clinical presentation of the ileocecal pathology are varied, from processes incidentally discovered until severe cases of acute abdomen. In both cases and in others, the role of the imaging is decisive.

**Diffusion-weighted MR Imaging of the Small Bowel: Current Status and Recommendations**

**PURPOSE/AIM**
Diffusion-weighted (DW) MR imaging is increasingly being used for the evaluation of abdominal diseases and bowel assessment. It may be helpful in Crohn's disease but also in a variety of small bowel (SB) diseases. The aim of this exhibit is to review the role of DW-MR imaging when performing MR enterography for SB disease.

**CONTENT ORGANIZATION**
The DW-MRI normal features of the SB and of the whole spectrum of SB diseases is described. Basic principles, technique and adequate MR protocols are discussed. Current role of DW-MRI in evaluating Crohn's disease, either for initial mapping or during follow-up of patients for evaluation of activity, or for detection of recurrence after surgery is reviewed. Its role in SB tumor detection or other SB diseases evaluation is also being studied. Results in terms of qualitative and quantitative evaluation are discussed and illustrated, throughout a review of the literature and of our experience. Pitfalls are discussed.

**SUMMARY**
After viewing this exhibit, the attendee will understand the current potential role of DW-MR imaging during MR enterography while evaluating SB disease. He will know current recommendations in terms of how and when to use DW-MRI imaging in Crohn disease as well as in a variety of SB disease. He will be familiar with the potential role of this promising technique and with its pitfalls.
**Diffusion-weighted MR Imaging of the Rectum: Current Status and Recommendations**

**LL-GIE2798**

Truong Luong Francis Nguyen, MD, PhD  
Pascal Roussset, MD  
Nedjoua Amara  
Sophie Deguelte-Lardiere  
Christine C Hoeffel, MD

**PURPOSE/AIM**

Rectal diffusion-weighted MR imaging is increasingly being used for the evaluation of rectal tumors, particularly in order to assess tumor response after neoadjuvant treatment. It is also used to evaluate potential pelvic recurrence in patients after colorectal surgery. The aim of this exhibit is to review the role of diffusion-weighted MR imaging of the rectum.

**CONTENT ORGANIZATION**

The diffusion-weighted MRI normal features of the rectum and of the whole spectrum of rectal diseases is described. Basic principles, technique and adequate MR protocols are discussed. Current role of MRI in evaluating rectal cancer, at initial MRI staging, after radiochemotherapy and after surgery is reviewed. Results in terms of qualitative and quantitative evaluation are discussed and illustrated, throughout a review of the literature and of our experience. Pitfalls are discussed.

**SUMMARY**

After viewing this exhibit, the attendee will understand the current potential role of diffusion-weighted rectal MR imaging. He will know current recommendations in terms of how and when to use diffusion-weighted MR imaging for initial and post-radiochemotherapy staging of rectal cancer as well as for post-surgical evaluation. He will be familiar with the potential role of this promising technique and with its pitfalls.

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**Cholangiolocellular Carcinoma: Comparison between Hemodynamic Pattern of Dynamic CT and Histopathologic Findings**

**LL-GIE2799**

Masakatsu Tsurusaki, MD, PhD  
Keitaro Sofue  
Tomoko Hyodo, MD  
Masahiro Okada, MD  
Mitsuru Matsuki, MD  
Takamichi Murakami, MD, PhD *  
Hidenori Ojima

**PURPOSE/AIM**

The aim of this educational exhibit is to make you familiarize cholangiolocellular carcinoma (CLC), mainly focused on the correlation of radiological imaging and pathological findings. The general clinical features, epidemiology, treatments, prognosis and pitfalls for diagnosis are also included for better understanding of CLC.

**CONTENT ORGANIZATION**

A. Review of Epidemiology  
B. General clinical feature (manifestation, laboratory data)  
C. Hemodynamic pattern and imaging findings of dynamic CT  
D. Morphological and pathological correlation  
E. Treatment/Surgical consideration/Prognosis  
G. Pitfalls/Differential diagnosis

**SUMMARY**

CLC is rare and one of the most difficult malignant liver tumors for clinical diagnosis before surgical operation, since CLC has combined characters of hepatocellular carcinoma (HCC) and cholangiocellular carcinoma (CCC) in radiological imaging. This exhibit shows past literatures review concerning CLC with our 10 cases (11 nodules) and present contrast-enhancement patterns compared with histopathologic findings in detail. Hemodynamic enhancement profile as well as providing unique information, and may contribute differential diagnosis between CLC and other common hepatic tumor.

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**Non-traumatic Acute Gastric Pathologies: A Case-based Review**

**LL-GIE2800**

Thomas J O'Neill, MD  
Bryan J Foley, MD  
Arya Bagherpour, DO  
Noemi Brunner Reynolds, MD  
Humera M Chaudhary, MBBS

**PURPOSE/AIM**

Review causes of non-traumatic life threatening acute gastric pathologies and discuss etiology and imaging findings of each cause as a case based review.

**CONTENT ORGANIZATION**

Review imaging modalities and protocols most helpful for the diagnosis of acute gastric pathologies including erect and supine radiographs, fluoroscopy with oral contrast and CT scans of the abdomen and pelvis. Review pertinent imaging findings along with clinical history, pathophysiology and treatment in cases of gastric volvulus, gastric perforation, gastric hemorrhage (intramural and intraluminal), gastric ischemia and gastric necrosis.

**SUMMARY**

Imaging plays a crucial role in the emergent detection and evaluation of gastric pathologies and radiologists should recognize the imaging findings that may require urgent intervention in the appropriate clinical scenario. This case-based review will focus on acute gastric pathologies with emphasis on etiology, imaging findings and treatment.

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**Pelvic Floor Dysfunction: How to Interpret Anorectal Disorders and Stage Pelvic Organ Prolapse**

**LL-GIE2801**

Catarina A Silva, MD  
Dean D Maglinte, MD *

**PURPOSE/AIM**

Review the imaging findings of exams used to assess pelvic floor disorders. Learn how to interpret anorectal dysfunction and stage pelvic organ prolapse using reference points used in clinical quantification.

**CONTENT ORGANIZATION**

Functional pelvic floor abnormalities represent a common health care problem.
Anatomy and Pathology of the Ischiorectal Space or Fossa: What the Radiologists Need to Tell the Surgeon in Their Report!

Maitraya K Patel, MD
Barbara M Kadell, MD
Cecilia M Jude, MD
Jeffrey Petersen, MD
Rinat Masamed, MD
Nina Woldenberg, MD

PURPOSE/AIM
1. To review the anatomy of the ischiorectal space
2. To know the most common causes of an ischiorectal mass
3. To provide a differential diagnosis of an ischiorectal mass based on the origin of the mass
4. To know the surgical approach to the resection of an ischiorectal mass
5. To report important information from the imaging exams to the surgeons

CONTENT ORGANIZATION
1. Anatomy of ischiorectal space
2. Imaging evaluation of ischiorectal mass
3. Common causes of ischiorectal mass
4. Differential diagnosis based on its origin
5. MR imaging classification of perianal fistulas
6. Surgical approach to resection of ischiorectal mass
7. Important information to report to the operating surgeons
   A. Origin
   B. Characteristics
   C. Extent of involvement in relation to levator ani muscle
   D. Invasion of adjacent structures

SUMMARY
MR imaging is the examination of choice in the evaluation of ischiorectal space abnormalities. Information that the radiologists must convey in the radiology report are origin, characteristics and extent of the ischiorectal mass with respect to the levator ani muscle, a key criterion on which the surgeon will base his surgical approach. Lastly, invasion of any adjacent pelvic structures needs to be identified so that the required surgical subspecialists will be included in the multidisciplinary team.

Vermiform Appendix Revisited: Multimodality Imaging Findings of Appendiceal Masses with Pathologic Correlation

LL-GIE2802
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Kyle R Walker, DO
Liem T Mansfield, MD
Michael J Reiter, MD
Ryan B Schwope, MD
Christopher J Lisanti, MD *

PURPOSE/AIM
1. To discuss the common appendiceal neoplastic and non-neoplastic masses, review their pathogenesis and clinical presentation
2. To describe the role of cross-sectional imaging in the detection and evaluation of appendiceal masses
3. To develop a practical check list to maximize the diagnostic abilities of radiologists

CONTENT ORGANIZATION
1. Introduction
2. Epidemiology, etiology and clinical presentations of appendiceal neoplastic and non-neoplastic masses
3. Diagnostic imaging findings– Relevant imaging findings of different appendiceal masses will be reviewed using a case-based method with pathologic correlation
4. Practical diagnostic approach to appendiceal masses
5. Conclusion & take home points

SUMMARY
Appendiceal masses commonly occur secondary to inflammatory or neoplastic pathologies. Appendicitis is the most common appendiceal pathology. An inflammatory appendiceal mass develops in 2%-6% of cases following acute appendicitis. Neoplastic appendiceal masses are uncommon, however, they include a wide range of pathologic entities. It is important to understand the different appendiceal pathologies and their radiological appearances to avoid misdiagnosis and subsequently mismanagement.

Murphyâ€™s Law: A Case-based Review of What Can Go Wrong in the Gallbladder

LL-GIE2804
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Rinat Masamed, MD
Jeffrey Petersen, MD
Cecilia M Jude, MD
Barbara M Kadel, MD
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PURPOSE/AIM
Case-based multimodal (US, CT, MR) imaging review of the radiologic features of the spectrum of gallbladder (GB) pathology with appropriate pathologic correlation. Review of the recommended diagnostic workup and natural history of the spectrum of GB pathology.

CONTENT ORGANIZATION
Image-rich case-based review of the spectrum of GB pathology with a focus on the epidemiology, clinical presentation, diagnostic workup, and indicated treatment or potential complications related to each entity. Pathologic correlation will be provided. Cases will include the spectrum of cholecystitis (acute, chronic, gangrenous, acalculous, hemorrhagic, emphysematous and xanthogranulomatous), hyperplastic cholecystoses (polyp, adenomyomatosis), and neoplasm (metastasis, lymphoma, primary adenocarcinoma).

SUMMARY
Comprehensive case-based imaging review with clinical and pathologic correlation of the spectrum of gallbladder pathology will be presented.
**Acute Pancreatitis: The Fundamental Role of Contrast Enhanced Computed Tomography (CECT)**

**LL-GIE2805**  
**Nicole Hughes, MD**  
**Valerie J Keough, MD**  

**PURPOSE/AIM**  
Review the revised Atlanta classification system of acute pancreatitis. Outline the importance of the radiologist's role in interpreting CECT in diagnosis and management of acute pancreatitis. Discuss potential pitfalls in CECT interpretation of acute pancreatitis. Demonstrate how accurate classification of findings on CT can improve the quality of communication between the treating physician and referring radiologist.

**CONTENT ORGANIZATION**  
Review the revised Atlanta classification of acute pancreatitis. Discuss imaging findings and appropriate classification of acute pancreatitis. Outline potential pitfalls. Summary/Review of Terminology.

**SUMMARY**  
CECT often plays an integral role in diagnosis and/or management of acute pancreatitis. The use of appropriate terminology, as outlined by the revised Atlanta classification system of acute pancreatitis, results in high quality reporting which addresses pertinent positives and negatives and leads to effective communication with referring physicians.

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**Self-expanding Metal Stent in Malignant Colonic Obstruction: Everything You Should Know**

**LL-GIE2806**  
**Ivan Mauricio Vargas Orozco, MD**  
**Alejandro Perez Martinez**  
**Carmen Cereceda Perez, MD**  
**Andres Enriquez-Puga, MBChB, MSc**  
**Sonia DieguezTapia, MD**  
**Rafael Morcillo Carratala, MD**

**PURPOSE/AIM**  
To review the indications of self-expanding metal stent and finding in imaging studies that may contraindicate its use.  
To describe normal imaging findings after stent placement.  
To highlight imaging finding appearing in case of complication.

**CONTENT ORGANIZATION**  

**SUMMARY**  
The use of the self-expanding metallic stents can achieve rapid and effective nonsurgical means to relieve left-sided colonic obstruction. It is important to radiologists to be familiar with colonic self-expanding metal stents indications, normal findings and complications.

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**MR Elastography of Liver Tumors: A Pictorial Essay**

**LL-GIE2807**  
**Emmanuel Visee**  
**Pascale Audet, MD**  
**Jean S Billiard, MD**  
**Richard L Ehman, MD**  
**An Tang, MD**

**PURPOSE/AIM**  
The purpose of this educational exhibit is: (1) to review the basic principles of magnetic resonance elastography (MRE) and (2) to provide a pictorial review of focal liver lesions on MRE.

**CONTENT ORGANIZATION**  
- Physics concepts: mechanical properties  - Review of MRE components: hardware, pulse sequence diagram and inversion algorithms  - Data interpretation: interpretation of wave images and elastograms in focal liver lesions  - Literature review: preliminary studies of MRE for characterization of liver tumors and background liver  - Performance of MRE as non-invasive technique to evaluate focal liver lesions  - Pictorial review of benign (cyst, hemangioma, hepatocellular adenoma, focal nodular hyperplasia) and malignant tumors (hepatocellular carcinoma, cholangiocarcinoma, metastasis)  - Pitfalls: iron deposition, wave interference and attenuation  - Future directions: multiple frequencies, strategies to improve spatial resolution and coverage.

**SUMMARY**  
The major teaching points of this exhibit are: (1) MRE is an adjunct diagnostic tool integrated to clinical MRI systems that provides in vivo biomechanical measurements and (2) MRE is an emerging tool for characterization of focal liver lesions.

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**Gastrointestinal Pathology Identified on Standard Chest Radiography: Living on the Edge**

**LL-GIE2808**  
**Theodora A Potretzke, MD**  
**Perry J Pickhardt, MD**  
**Sanjeev Bhalla, MD**

**PURPOSE/AIM**  
The chest radiograph remains the most frequently performed radiologic examination. Although it is primarily ordered for the evaluation of cardiopulmonary disease, it may reveal gastrointestinal pathology. This may be incidental or may account for the patient’s symptoms. In many cases, the findings warrant further work-up. The purpose of this exhibit is to provide an interactive case-based review of the spectrum of gastrointestinal pathology detectable on a chest radiograph. This will include benign, malignant, traumatic, acute nontraumatic, and subacute or chronic entities. By the exhibit’s end, participants will be familiar with the range of gastrointestinal pathology that can be detected on a chest radiograph, their imaging appearance, and their potentially distinguishing imaging features.

**CONTENT ORGANIZATION**  
- Esophagus– rupture, carcinoma, achalasia; Stomach– perforated ulcer, GIST, herniation; Colon– pneumatosis, perforation, IBD; Hepatobiliary– emphysematous cholecystitis, Echinococcal cyst, varices; Spleen– pseudocyst, splenomegaly; Pancreas– pseudocyst, pancreatic rest

**SUMMARY**  
By recognizing gastrointestinal pathology on chest radiography, the radiologist may identify an unanticipated explanation for the patient’s symptoms and may expedite treatment of potentially life-threatening conditions. This exhibit provides an interactive case-based review of this topic.
LL-GIE2809
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Hilary L Purdy, MD
Marina Mittyul, BS
Dennis M Balfe, MD
Vincent M Mellnick, MD
Christine O Menias, MD

PURPOSE/AIM
Gastrointestinal polyposis syndromes are associated with significant morbidity and mortality, most commonly gastrointestinal malignancies. However, many of these syndromes also have extraintestinal manifestations. This pictorial review will discuss manifestations and management of inherited and noninherited polyposis syndromes.

CONTENT ORGANIZATION
Epidemiology, clinical presentation, histopathology and management of the polyposis syndromes:

- Inherited adenomatous polyposis syndromes including familial adenomatous polyposis, Gardner’s, Lynch and Turcot syndromes
- Inherited hamartomatous polyposis syndromes including Peutz-Jeghers, familial juvenile polyposis, Cowden’s and Bannayan-Riley-Ruvalcava syndromes
- Noninherited polyposis syndromes including Cronkhite-Canada syndrome and hyperplastic polyposis

Typical radiologic appearance of these entities in multiple modalities including their extraintestinal manifestations, examples of which include glioblastoma multiforme in Turcot syndrome and thyroid cancer in Cowden syndrome.

SUMMARY
The morbidity and mortality of the polyposis syndromes can be improved with accurate diagnosis and routine surveillance. Radiologists must understand these syndromes not only to identify their gastrointestinal complications but to have an increased index of suspicion for the extraintestinal manifestations.

Multi-modality Imaging and Management of IPMN and MCN of the Pancreas Based on New International Consensus Guidelines 2012

LL-GIE2810
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Nagaaki Marugami
Junko Takahama, MD
Aki Takahashi, MD
Kimihiko Kichikawa, MD

PURPOSE/AIM
The purpose of this exhibit is to:
1. To understand the new International consensus guidelines 2012 for the management of IPMN and MCN of the pancreas compared with 2006 guidelines.
2. To review the multi-modality images of IPMN and MCN with pathologic correlation.

CONTENT ORGANIZATION
1) Review the basics of IPMN and MCN of the pancreas.
2) Introduce the new multi-modality imaging approach; High-resolution Ultrasound, Contrast enhanced-Endoscopic Ultrasound and MRCP at 3 Tesla.
3) Understand the new International consensus guidelines 2012 for the management of IPMN and MCN of the pancreas (classification, investigation, indications for and methods of resection, histological aspects, and methods of follow-up) compared with 2006 guidelines
4) Clinical case presentation; IPMN (BD-IPMN, MD-IPMN, Worrisome feature, High-risk stigmata and IPMC), MCN (benign and malignant) and mimics based on new guidelines
5) Discuss the remaining controversial.

SUMMARY
The clinical management of IPMN and MCN of Pancreas is performed mainly based on the radiological findings. Radiologists play a major role in the surveillance, detection, differentiation and follow up of IPMN and MCN.

Multimodality Approach to Primary Cystic Peritoneal Masses and Intraabdominal Cystic Mimickers: What Every Radiologist Should Know

LL-GIE2811
Maria Arraiza, MD
Ur Metser, MD
Korosh Khalili, MD
Rajkumar Vajpeyi
Erin Kennedy, MD
Sangeet Ghai, MD

PURPOSE/AIM
Review the classification and imaging features of primary cystic peritoneal masses and intraabdominal cystic mimickers providing tips and pearls for an accurate diagnosis

CONTENT ORGANIZATION
Peritoneal cystic lesions may be divided into 4 categories according to their lining on histology: endothelial (lymphangiomas), epithelial (enteric cysts, enteric duplication cysts, cystadenoma, cystadenocarcinoma, pseudomyxoma peritonei), mesothelial (mesothelial cysts, multilocular cystic mesothelioma) and others (germ cell tumors, sex cord gonadal stromal tumors, cystic mesenchymal tumors, fibrous wall tumors, infectious cystic peritoneal lesions). Lymphangiomas are multilocular benign congenital malformations of the lymphatic vessels. Double-layered wall US sign along mesenteric bowel side may help the diagnosis of enteric duplication cysts. Pseudomyxoma peritonei appears as loculated fluid collections in the abdomen and may scallop visceral surfaces. Infectious cystic peritoneal lesions like hydatid cysts have specific imaging features. Intra-abdominal peritoneal cystic collections such as abscess, seroma, biloma, urinoma or lymphocele should be recognized as potential mimickers

SUMMARY
Knowledge of the multimodality imaging appearance of cystic peritoneal lesions and intra-abdominal mimickers may help radiologists achieve greater specificity in diagnostic reporting

Diffusion-weighted MR Imaging for Non-neoplastic Conditions in the Hepatobiliopancreatic Region: Pearls and Potential Pitfalls in Imaging Interpretation

LL-GIE2812
Suk Kim, MD
Nam Kyung Lee, MD
Tae Un Kim
Hyung Il Seo, MD

PURPOSE/AIM
Review the classification and imaging features of non-neoplastic conditions in the hepatobiliopancreatic region providing tips and pearls for an accurate diagnosis

CONTENT ORGANIZATION
Non-neoplastic conditions in the hepatobiliopancreatic region may be divided into 4 categories according to their imaging features: vascular (hemorrhage, aneurysm, pseudoaneurysm, arteriovenous malformation, fistula), biliary (choledocholithiasis, choledochal cyst, bile duct stricture, pancreatitis), pancreatic (acute pancreatitis, chronic pancreatitis, pseudocyst, pancreatic abscess), and gastrointestinal (gastrointestinal perforation, diverticulitis, mesenteric ischemia).

SUMMARY
Knowledge of the multimodality imaging appearance of non-neoplastic conditions in the hepatobiliopancreatic region may help radiologists achieve greater specificity in diagnostic reporting.
Dong Uk Kim

PURPOSE/AIM
1. List diffusion-restricted non-neoplastic conditions in the hepatobiliopancreatic region
2. Recognize conventional MR and DWI features of various non-neoplastic conditions in the hepatobiliopancreatic region
3. Differentiate diffusion-restricted neoplastic from non-neoplastic conditions in the hepatobiliopancreatic region at MR with DWI

CONTENT ORGANIZATION
Introduction Basic concept Diffusion-restricted non-neoplastic conditions

Liver: liver abscess, eosinophilic infiltration or necrosis, granulomatous infection, inflammatory pseudotumor, pyelophlebitis
Biliary tract: acute cholecystitis, xanthogranulomatous cholecystitis, empyema, hemobilia, infection in the ampulla of Vater
Pancreas: acute pancreatitis, mass-forming pancreatitis, autoimmune pancreatitis
Miscellaneous

Conclusion

SUMMARY
Because hepatic eosinophilic infiltration or inflammatory pseudotumor has various MR appearances, it is difficult to distinguish it from hepatic metastasis or HCC.
1. Differentiating gallbladder cancer from xanthogranulomatous cholecystitis may be difficult at MR with DWI, because of overlapping MR features between two entities.
2. Although focal autoimmune pancreatitis can be mistaken for pancreatic cancer, MR features such as pancreatic duct dilatation, and distal pancreatic atrophy may favor the diagnosis of pancreatic cancer.

Rectal Cancer: Role of 3T MRI in Staging

LL-GIE2813
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Ankur Shah, MD
Megha Sanghvi, MD
Laxmi V Bhobe, DMRD
Mrunali I Shah, MBBS
Nishat Goyal, MBBS, DMRD

PURPOSE/AIM
The purpose of this exhibit is:
1. The relevance of pre-operative MR imaging in staging and local extent of primary rectal cancer
2. Crucial role of MRI in deciding treatment plan especially about neoadjuvant concurrent chemo radiotherapy
3. To evaluate for tumor recurrence in post operative patients by 3T MRI
4. To learn limitations and technical pitfalls of MRI as imaging modality in evaluation of rectal cancer

CONTENT ORGANIZATION
• Pathophysiology of rectal cancer
• Review of MRI protocols, sequences and technique in staging of rectal cancer. Importance of high resolution T2W images and volumetric analysis
• Discussing imaging spectrum of Ca rectum with respect to its location, CRM, T and N staging
• Precise role of high resolution MRI in post operative status
• Sample cases and images

SUMMARY
The major teaching points of this exhibit are:
1. MRI is most sensitive and accurate tool for local staging of rectal cancer especially using high resolution multi planar T2W images
2. It is important to understand limitations of MRI alone in post-operative, nodal and metastatic staging
3. The exhibit will help in understanding for local tumor spread thereby guiding the management

MR Enterography: Practical Technical Guide for Scan Optimization and Troubleshooting

LL-GIE2814
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Santiago Sotes
Sonia Rodriguez, MD
Cesar Garrido
Thomas L Chenevert, PhD *
Mahmoud M Al-Hawary, MD
Carmen Ayuso

PURPOSE/AIM
- To provide optimal scanning parameters and techniques for obtaining a feasible MR enterography (MRE) protocol under optimal quality standards. - To offer practical solutions related to patient preparation and collaboration during MRE.
- To discuss different methods to overcome the most common technical problems that can occur during scan acquisition.

CONTENT ORGANIZATION
A) Technical requirements pertaining to MRE. B) Outline of the most common sequences employed in routine MRE. C) Technical aspects: optimization of parameters in each sequence between major MR systems vendors. D) MR findings: representative examples of commonly encountered scanning problems and suggested solutions. E) Brief description of new functional MR sequences and their use in MRE.

SUMMARY
MRE examinations are increasingly utilized in small bowel imaging, in particular in imaging patients with inflammatory bowel disease. However, several inherent difficulties and limitations to MR and imaging of the bowel are commonly encountered. Knowledge about patient preparation, scan technique and sequence parameters optimization as well familiarity with commonly encountered problems that can arise during scan acquisition is of paramount importance for the MR technologists and interpreting radiologists.

MDCT in Small and Large Bowel Obstruction: What the Surgeon Needs to Know

LL-GIE2815
Hyun Cheol Kim
Sang Won Kim, MD
Dal Mo Yang
Wook Jin
Seong Jin Park, MD, PhD

PURPOSE/AIM
1. To discuss the role of MDCT in patients with suspected bowel obstruction
2. To demonstrate MDCT findings of decisions making regarding surgery in patients with bowel obstruction due to adhesion
3. To illustrate common and uncommon causes of a bowel obstruction that needs surgery

CONTENT ORGANIZATION
1. General diagnostic algorithm of MDCT in bowel obstructions
2. MDCT findings of bowel obstructions by adhesion – surgical indication
   (a) High grade obstruction
   (b) Abnormal vascular course around transition zone
   (c) Closed-loop obstruction
   (d) Strangulated obstruction
3. Causes required surgery other than adhesion
   (a) Extrinsic (hernia, extrinsic tumors in the mesentery or retroperitoneum, volvulus)
   (b) Intrinsic (small and large bowel cancer, Crohn’s disease, intussusception)
   (c) Intraluminal (gallstone, bezoar)

SUMMARY
MDCT plays a crucial role in the therapeutic approach of the patients with bowel obstruction. Radiologists need to be familiar with a broad spectrum of MDCT findings of bowel obstruction requiring surgery.
Imaging of the Biliary Tract Inflammation and Functional Disorder: An Update

LL-GIE2819
Hoon Ji , MD, PhD
Aiham Korbage , MD
Jonathan Nguyen , MD

PURPOSE/AIM
To demonstrate the update on imaging diagnosis of biliary tract inflammation and functional disorder, including the MR cholangiography using biliary-excreted contrast material.

CONTENT ORGANIZATION
To review the key biliary and enteric anatomic or pathophysiologic issues causing biliary tract inflammation and biliary functional disorder.

To discuss the new biliary imaging techniques including optimal protocol for biliary phase of the Gd-EOB-DTPA enhanced MRI. To demonstrate the diagnostic findings of the biliary tract inflammation and the various causes of biliary functional disorder, including primary biliary cirrhosis, primary sclerosing cholangitis, cholestasis with bile duct obstruction, ampullary stenosis, duodeno-gastric bile reflux, and miscellaneous.

SUMMARY
The rapidly evolving technology for imaging of the biliary tract will continue to present radiologists with opportunities and challenges. Improved diagnosis of biliary tract inflammation and functional disorder can be achieved with a knowledge of the benefits and limitations of modern imaging techniques, including the MR cholangiography using biliary-excreted contrast material. Familiarity with the appearances of the biliary duct and surrounding structures as well as with the pathophysiology of the bile excretion is also important for accurate image interpretation.

A Review of the Imaging of Primary Sclerosing Cholangitis

LL-GIE2820
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PURPOSE/AIM
Primary sclerosing cholangitis is an autoimmune disease of the biliary system. Whilst the etiology is primarily idiopathic, there is a strong association with ulcerative colitis and an increased risk of transformation into cholangiocarcinoma. Biochemical markers and histopathological diagnosis are non specific in this condition and accurate diagnosis heavily relies on imaging findings.

CONTENT ORGANIZATION
MRCP is currently the gold standard for non-invasive imaging of the biliary tree with sensitivity levels comparable to ERCP. However both modalities complement each other and a negative MRCP will not obviate the need for an ERCP in the diagnosis of primary scleroising cholangitis. We present a review of the imaging protocols, appearances of early and late primary sclerosing cholangitis and its complications on US, CT, MRCP and ERCP. Conditions mimicking primary sclerosing cholangitis on imaging such as ascending cholangitis, primary biliary cirrhosis, ischaemic cholangitis, drug toxicity and diffuse liver metastasis will also be reviewed.

SUMMARY
Primary sclerosing cholangitis is a relatively rare condition affecting the biliary system which is progressive and can undergo malignant transformation. Current imaging modalities provide adequate early diagnosis and follow up of this condition. Accurate recognition of its imaging features is therefore vital.

Pictorial Review of Systemic Lupus Associated Enteritis

LL-GIE2821
Yaqi Shen , PhD, MD
Wei Li
Daoyu Hu , MD, PhD

PURPOSE/AIM
To review the radiologist related diagnostic criteria of systemic lupus associated enteritis, illustrated with 10 years diagnostic experiences and images in patients over 4 years follow up.

CONTENT ORGANIZATION
To some of systemic lupus erythematosus patients, acute abdominal pain could be the only and first symptom they have. To review the latest diagnostic criteria of systemic lupus, and to describe the pathophysiology related imaging findings, illustrated with typical radiological images and follow up images.

SUMMARY
For radiologists, especially for residents, knowledge of systemic lupus associated enteritis could give an important diagnosis and/or prediction for physicians when facing an acute abdominal pain patient.

The Postcholecystectomy Syndrome: A Review of Etiology and Its Imaging Diagnosis

LL-GIE2822
Hoon Ji , MD, PhD
Jonathan Nguyen , MD
Aiham Korbage , MD

PURPOSE/AIM
To review various causes of chronic recurring pain after cholecystectomy (postcholecystectomy syndrome: PCS). To discuss tailored imaging techniques and parameters to evaluate PCS including gadoteric acid-enhanced hepatobiliary phase MRI.

CONTENT ORGANIZATION
To review extrabiliary, organic biliary, and functional biliary etiology of PCS. To introduce comprehensive tailored imaging protocols to evaluate PCS on secretin stimulated MR cholangiopancreatography and gadoteric acid-enhanced hepatobiliary phase MRI. To demonstrate diagnostic imaging features which can provide etiology of PCS and useful information for its management.

SUMMARY
PCS can present with wide range of etiology, and often diagnostic dilemma. Tailored imaging techniques using secretin stimulated MR
Look Out Below! Imaging Rectal Emergencies

LL-GIE2823
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Constantine A Raptis, MD
Vincent M Melnick, MD
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PURPOSE/AIM
2. Present a case-based approach to illustrate the essential imaging findings used to accurately identify rectal emergencies.

CONTENT ORGANIZATION
1. Introduction including review of rectal anatomy.
2. Case-based presentation of rectal emergencies and their associated complications across multiple modalities. Rectal emergencies to be reviewed include infections such as rectal syphilis, hemorrhage, rectal hematoma, ischemia, radiation strictures complicated by perforation and abscess formation, penetrating trauma, and rectal intussusception with resultant distal large bowel obstruction.

SUMMARY
Rectal emergencies have a broad range of etiologies and imaging presentations. This exhibit will emphasize the essential imaging features of rectal emergencies ranging from rectal syphilis, rectal radiation strictures, abscess formation and perforation, to penetrating trauma and rectal obstruction secondary to foreign body insertion. Clinical presentation, subsequent management, and pathologic correlation will also be reviewed.

Identifying Infiltrative Hepatocellular Carcinoma Using LI-RADS v2013.1

LL-GIE2824
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PURPOSE/AIM
The purpose of this exhibit is to:
1. Define infiltrative HCC.
2. Define imaging features suggestive of infiltrative HCC.
3. Review schematic, CT, and MR images of infiltrative HCC.

CONTENT ORGANIZATION
- Introduction to LI-RADS: LI-RADS is an ACR-endorsed system of standardized terminology and criteria to interpret and report imaging examinations of the liver. LI-RADS assigns an ordinal score (1 to 5) to liver observations indicating likelihood of HCC
- Infiltrative HCC definition: variant of HCC with permeative growth pattern
- Imaging features suggestive of infiltrative HCC
- Sample CT/MR images and schematics of infiltrative HCC as well as select imaging features suggestive of infiltrative HCC

SUMMARY
The teaching points of this exhibit are:
1. At imaging, infiltrative HCC may manifest as a diffuse ill-defined mass, often involving more than one segment.
2. Infiltrative HCCs may be difficult to detect in the cirrhotic liver at CT and MRI. Pre-contrast imaging may be helpful. Careful analysis of all available images is often necessary.
3. Imaging features suggestive of infiltrative HCC include:
   - Heterogeneous attenuation/signal intensity
   - T1 hyper-intensity
   - T2 hyper-intensity
   - Restricted diffusion
   - Heterogeneous enhancement in one or more phases
   - Tumor in vein
   - Architectural distortion

MRI Characteristics of Paraduodenal Pancreatitis: A Diagnostic Challenge

LL-GIE2825
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Pardeep K Mittal, MD

PURPOSE/AIM
Paraduodenal (or pancreaticoduodenal groove) pancreatitis is a rare form of chronic pancreatitis, with symptoms dominated by obstruction of the duodenum, common bile duct, and pancreatic duct. The etiology is unclear, but thought to result from either ectopic pancreatic tissue in the duodenal wall or obstruction of the accessory pancreatic duct. We will review the key imaging findings of paraduodenal pancreatitis, and differentiate it from chronic pancreatitis, pancreatic adenocarcinoma, duodenal carcinoma, and duodenal peptic ulcer disease, each of which is a potential mimic.

CONTENT ORGANIZATION
- Overview, epidemiology, and anatomy as it relates to treatment planning
- Multimodality imaging features of paraduodenal pancreatitis, with...
Overview, epidemiology, and anatomy as it relates to treatment planning. Multimodality imaging features of paraduodenal pancreatitis, with a focus on contrast-enhanced MRI:

1. Cystic change in the duodenal wall
2. Fibrosis in the pancreaticoduodenal groove
3. Narrowing of the duodenal lumen

Imaging pitfalls and mimics, including adenocarcinoma and peptic ulcer disease. Case presentations

SUMMARY
Paraduodenal pancreatitis is an uncommon variant of a common disease. Contrast-enhanced MRI is particularly useful to demonstrate the characteristic fibrosis and inflammatory changes in the pancreaticoduodenal groove and duodenum, and can often yield a specific diagnosis.

**Pictorial Essay of Sacral and Presacral Lesions**

**LL-GIE2826**

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April Farley, MD
Thomas W Loehfelm, MD, PhD
Patrick S Sullivan, MD
Courtney A Coursey, MD *

**PURPOSE/AIM**
Review the imaging findings (MR and CT) of sacral and presacral lesions with a focus on differentiating among the commonest etiologies using epidemiology and MR characteristics. We will review our standard MR protocol for imaging the pelvis including as part of a standard abdomen/pelvis exam and more focused evaluation of a known lesion.

**CONTENT ORGANIZATION**
Presentation overview, epidemiology, anatomy, and clinical relevance

Multimodality imaging features of sacral and presacral masses, with a focus on MR imaging characteristics that allow for a focused differential or specific diagnosis. Examples will include:

1. Retrorectal cystic hamartoma (tailgut cyst)
2. Chordoma
3. Osteochondroma
4. Chondrosarcoma
5. Epidermoid cyst
6. Meningocele
7. Nerve sheath tumor
8. Endometrioma
9. Sacrococcygeal teratoma
10. Colorectal cancer
11. Abscess

Review of imaging pitfalls and mimics. Case presentations

SUMMARY
The sacrum and presacral space are anatomically complex, and can give rise to lesions originating from musculoskeletal, nervous system, fibrous connective tissue, bowel, and gynecologic sources. Integrating relevant epidemiology and anatomy with specific imaging features can usually lead to a focused differential or specific diagnosis.

**Magnetic Resonance Imaging with Gd-EOB-DTPA: Extrahepatic Pathology**

**LL-GIE2827**

Gory Ballester, MD
Naveen Garg, MD *
Fanny E Moron, MD
Khaled M Elsayes, MD
Janio Szklaruk, MD, PhD

**PURPOSE/AIM**
To present and discuss the MR appearance of non-hepatic masses following the intravenous administration of Gadoxetate Disodium (Gd-EOB-DTPA). To compare this appearance with examples following intravenous administration of Gadopentetate dimeglumine.

**CONTENT ORGANIZATION**
Examples of the appearance of extrahepatic pathology at various phases of contrast administration following the dynamic administration of Gd-EOB-DTPA will be shown. Comparative examples, on the same patient, following the intravenous administration of Gadopentetate dimeglumine will be shown. The pathology includes a variety of benign and malignant masses.

SUMMARY
Gd-EOB-DTPA is frequently used in the assessment of liver pathology. Many of these patients have extrahepatic benign or malignant masses. Familiarity with the MR appearance of these masses following the administration of Gd-EOB-DTPA is important for correct image interpretation. Knowledge of pitfalls of using the hepatocyte phase of contrast administration as the main diagnostic imaging sequence will be discussed. Upon completion of this exhibit, the radiologist will become familiar with the MR appearance of extrahepatic tumors at the multiple phases following the intravenous administration of Gd-EOB-DTPA. The radiologist will also learn to compare this appearance with the imaging features with Gadopentetate dimeglumine.

**Cystic Fibrosis Below the Diaphragm: Abdominal Complications of the Disease in Adult Patients**

**LL-GIE2828**

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Eric J Heffernan, MBCh, FRCR
Dermot E Malone, MD

**PURPOSE/AIM**
Mutation of the cystic fibrosis transmembrane conductance regulator gene on Chromosome 7 results in production of abnormally viscous mucus and secretions in the lungs of patients with CF. A similar pathological process occurs in the abdomen; gastrointestinal tract, pancreas and hepatobiliary system. Inspissated mucus causes luminal obstruction and resultant clinical and radiological complications associated with the disease process. As life expectancy continues to improve, abdominal complications are becoming an increasingly significant cause of morbidity in CF patients. Awareness of these manifestations can facilitate timely diagnosis and guide management.

**CONTENT ORGANIZATION**
Illustration of common and uncommon abdominal manifestations using a systems based approach:
When Infarction Goes South: MR Imaging and MDCT Findings of Ischemic Involvement of Abdominal Organs

LL-GIE2829
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Tatiana C Takayasu, MD
Natalia Sabaneef, MD

PURPOSE/AIM
Nontraumatic ischemic lesions of abdominal organs are a well-known cause of pain and should be quickly and accurately diagnosed, because of their drastic clinical implications. MDCT and MR imaging are noninvasive methods that may promptly assess the diagnosis and degree of organ damage. Furthermore, protocols such as AngioCT and AngioMR may further contribute with relevant information.

CONTENT ORGANIZATION
Vascular anatomy review; MRI and MDCT protocols; emphasis on MDCT and MRI characteristic of primary and secondary findings of ischemic lesions in abdominal organs using sample cases; the following conditions will be illustrated: arterial dissection, atherosclerosis, atherothrombosis, vasculitis, infection, neoplastic angiogenesis, venous thrombosis, internal hernias and volvuli etc; post processed imaging and their importance;

SUMMARY
Non-traumatic ischemic lesions may indicate serious underlying conditions and usually require immediate assistance; Frequently, chronic ischemic lesions are detected in routine abdominal scans, and its recognition may direct the attention to otherwise unknown cardiovascular or cerebrovascular conditions; MRI and MDCT are noninvasive methods that help in the diagnosis of these entities, with or without specific vascular protocols

Beware of Spilled Gallstone-An Impostor

LL-GIE2830
Marwa G Elsayed, MBBS
Tanzilah A Barrow, MBBCh
Maria Chipfahl, MBBS

PURPOSE/AIM
The purpose of the exhibit is:
1. To demonstrate and replenish the reporters awareness of radiological features of complications consequent to intra-abdominal dropped gallstones on US, CT and MRI.
2. To discuss radiological mimics of unretrieved spilled gallstones for example: actinomycosis, hydatid disease and peritoneal metastasis.
3. To briefly discuss pathology, incidence and possible risk factors that may contribute to complications.

CONTENT ORGANIZATION
2. Pictorial review of the pre and postoperative radiological features of spilled gallstones in different sites on different imaging modalities.
3. Illustrate anatomy and discuss pathology that contributes to the rare but significant delayed complications of spilled gallstones and its mimics.

SUMMARY
At the end of this exhibit, the viewer would understand:
1. Hallmark imaging features specific to spilled gallstones on Ultrasound, CT and MRI.
2. Though uncommon, spilled gallstones can act as a source of postoperative morbidity and can pose a diagnostic challenge.
3. Radiologists should be aware of this entity to enable prompt recognition and aid early diagnosis and appropriate treatment.

The Expanding Role of Imaging and Intervention in the Multidisciplinary Treatment of Colorectal Liver Metastases (CRLM): An Update for 2013

LL-GIE2831
Luis S Guimaraes, MD
Kartik S Jhaveri, MD*

PURPOSE/AIM
CONTENT ORGANIZATION

SUMMARY
Therapeutic and prognostic concepts for patients with CRLM have dramatically changed over the past few years. Radiologists need to be well aware of the implications of diagnostic imaging and reporting in order to play a pivotal role in the current multidisciplinary treatment of CRLM.

DOTCOM: Diseases Other Than Crohn on MR Enterography

LL-GIE2832
Phey M Yeap, MBChB
Jonathan Weir-McCall, MBBCh, FRCR
Infiltrative Hepatocellular Carcinoma (I-HCC): What the Abdominal Radiologist Needs to Know

**PURPOSE/AIM**
To provide a description of infiltrative hepatocellular carcinoma (I-HCC), a relatively common but difficult to diagnose subtype, and to review key cross sectional CT and MR imaging findings that can help the abdominal radiologist reach a correct diagnosis.

**CONTENT ORGANIZATION**
- Description of available data on incidence and risk factors for I-HCC
- Review of CT and MR imaging findings and clues for diagnosis, with examples (e.g. markedly elevated alpha-fetoprotein; role of T2-weighted and diffusion-weighted imaging; appearance on dynamic study post-contrast injection; portal vein invasion; appearance on hepatobiliary-phase MR images post administration of Gd-EOB-DTPA).
- Discussion of the role of CT/MR for image guided biopsy.
- Summary of pathologic findings, management, and prognosis of I-HCC.

**SUMMARY**
I-HCC is a relatively common subtype of hepatocellular carcinoma that carries a poor prognosis and is often a challenging imaging diagnosis. The infiltrative, often diffuse process may be difficult to distinguish from background cirrhosis; diagnosis may be easily delayed or missed if clinical suspicion is not high. Knowledge of tumor characteristics and imaging presentation will help the radiologist formulate a correct and timely diagnosis.

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When the Going Gets Tough: A Review of Gastrointestinal Motility Disorders

**PURPOSE/AIM**
Review common and uncommon GI motility disorders
- Review clinical approach, imaging features, role of the radiologist in diagnosis of these disorders
- Review algorithmic approach to arrive at a differential diagnosis

**CONTENT ORGANIZATION**
GI motility disorders are often diagnosis of exclusion, and may be overlooked. Obstructive lesions may be mistaken for dysmotility. We will review imaging features of common and uncommon GI motility disorders: achalasia, visceral myopathies and neuropathies, diverticular disease, systemic sclerosis, hypomotility syndromes, dumping syndrome, intestinal reflex, post-vagotomy motility disorders
- Disorders such as pyloric stenosis, intestinal obstruction , diverticular disease, and intestinal reflux can resemble GI dysmotility
- Demonstrate imaging features including fluoroscopy with video clips, CT, MRI, and relevant pathologic and surgical photos
- Review clinical approach from time of suspected diagnosis, imaging, and follow up
- Algorithmic approach based on pattern of clinical and imaging findings to arrive at a differential diagnosis

**SUMMARY**
- Major teaching points are:
  - Learn the characteristic imaging features and pattern of occurrence of GI motility disorders
  - Learn about clinical approach and the role of radiologist in management of these patients
  - Learn algorithmic approach to formulate a differential diagnosis

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Benign and Malignant Pancreatic Cystic Lesions: Image-based Comparison of American College of Radiology and American College of Gastroenterology Guidelines

**PURPOSE/AIM**
Pancreatic cystic lesions are receiving increased attention due to widespread use of abdominal imaging. Their natural history and optimal management remains controversial. This exhibit reviews their imaging characteristics and compares the guidelines published by American College of Radiology (ACR) and American College of Gastroenterology (ACG)

**CONTENT ORGANIZATION**
Review incidental pancreatic cystic mass work pathway as suggested by American College of Radiology (Berland et al/Managing Incidentalomas on Abdominal CT). Review imaging work up of pancreatic cystic mass suggested by American College of Gastroenterology (Khalid et al, ACR Practice Guidelines for the Diagnosis and Management of Neoplastic Pancreatic Cysts) Compare and highlight the differences between ACR and ACG recommendation Provide pictorial essay of different pancreatic cystic masses and illustrate possible...
management based on ACR and ACG guidelines

SUMMARY
Radiologists play a key role in identifying the pancreatic cystic lesions and guiding the imaging work up. Understanding radiological and clinical guidelines can assist the radiologist in optimally guiding clinical management and communication with referring clinicians.

Role of MDCT Angiography in Preoperative Evaluation of Abdominal Wall Perforators Prior to Breast Reconstructive Surgery: A Radio-surgical Correlation

LL-GIE2836
Sharad Maheshwari, MD
Quazi G Ahmad, MBBS, MRCS
Abhijit A Raut, MD

PURPOSE/AIM
Aim is to familiarise radiologist to the vascular anatomy of Deep inferior epigastric artery and its abdominal wall perforators. Abdominal perforator flap surgery has become the mainstay for complex breast reconstructive surgery. Chief advantage of using perforator flaps is that it spares the muscle from donor site and helps achieve lower morbidity and faster recovery for patient. It is very essential pre-operatively for surgeons to understand the anatomy and raise the appropriate flap.

CONTENT ORGANIZATION
1. Anatomy of the deep inferior epigastric artery (DIEA) and its perforators
2. CT Technique for achieving high quality imaging
3. Use of 3D VRT, MIP and MPR technique in demonstrating the vasculature anatomy
4. Image analysis: Various anatomical details, variations and measurements required for demonstrating appropriate perforators
5. Surgical technique
6. Correlative CT and surgical images from same patients

SUMMARY
MDCT Angiography is an accurate technique in depicting the vascular anatomy of the deep inferior epigastric artery and its perforators. It helps the surgeon to identify the most suitable dominant perforator, accurate mapping and expedite the surgical procedure reducing morbidity and achieving faster recovery for the patient. For the patient it is an emotionally journey with a better acceptance.

Peer Review of Pancreatitis Imaging Studies: Analysis of Errors and Strategies for Improving Performance

LL-GIE2837
Nicholas Telischak, MD, MS
Bettina Siewert, MD
Jonathan B Kruskal, MD, PhD*

PURPOSE/AIM
Our institutional peer review database is a learning tool that provides an anonymous means for radiologists to learn from their own and others missteps. Root cause analysis of errors and their contributors allows for improvement strategies to be introduced, and for targeted educational media to be developed. Using our 9-year database of cases of pancreatitis, the purpose of this exhibit is to illustrate the spectrum of discrepancies, their major contributors and to suggest strategies for minimizing occurrence of errors.

CONTENT ORGANIZATION
Classification of errors of pancreatitis imaging
Perceptual misses and contributing factors including window-level optimization and anatomic variants
Interpretive errors, recognizing significance or findings, placing clinical information in appropriate context
Communication error in which the correct conclusion is drawn but provider behavior is not appropriately influenced due to lack of appropriate information transfer
Technical and procedural complications, which are common causes of pancreatitis in the hospital setting
Learned strategies for preventing errors when interpreting studies in the setting of acute pancreatitis

SUMMARY
This exhibit outlines error classification in the imaging of acute pancreatitis, with examples from our QA database, and strategies for error avoidance.

Metastatic Spreads from the Gastric Cancer on Imaging: Where-When-How

LL-GIE2838
Joo Hee Kim
Jooneeok Lim, MD
Jin-Young Choi
Eun-Suk Cho
Jeong-Sik Yu, MD
Jae-Joon Chung, MD
Myeong-Jin Kim, MD, PhD

PURPOSE/AIM
The purpose of the exhibit is:
(1) To discuss a detailed knowledge of the different patterns of metastatic spread from gastric cancer
(2) To illustrate gastric cancer spreads, where-when-how
(3) To demonstrate metastatic spreads from gastric cancer on sectional and functional images

CONTENT ORGANIZATION
- Disease spread to the regional and distant lymph nodes
- Disease spread to the transverse colon and rectum
- Disease spread to the urinary system
- Disease spread to the ovaries
- Disease spread to the liver and other distant organs
- Disease spread to the peritoneum
- Imaging evaluation of disease spread from the gastric cancer

SUMMARY
The major teaching points of this exhibit are:
(1) There was a deal of controversy about some pathways of disease spread from gastric cancer and it was also hard to attain its preoperative or postoperative accurate assessment by imaging.
(2) For the radiologists, the awareness of common metastatic spread and its pathophysiology in gastric cancer is helpful in interpretation of sectional images and early detection of distant metastases. We are going to illustrate pathways of disease spread from gastric cancer and discuss the imaging diagnosis and assessment of treatment response of metastatic diseases.

Atypical and Challenging Cases of Appendicitis on CT: Pearls and Pitfalls of Interpretation

LL-GIE2839
PURPOSE/AIM
Appendicitis is commonly encountered in daily clinical practice. In our experience, the preoperative diagnosis of appendicitis nowadays has become heavily, if not exclusively, reliant upon imaging with decreasing emphasis on clinical and laboratory presentation. However, we have encountered multiple appendicitis cases that are not straightforward by imaging. The aim of this exhibit is to discuss the 'atypical' imaging presentation of appendicitis on CT and the lessons learned from these challenging cases.

CONTENT ORGANIZATION

SUMMARY
The diagnosis of appendicitis by imaging can be challenging when it does not conform to classic presentation. After viewing this exhibit, one will become more familiar with the varied spectrum of appendicitis on CT. The pearls and pitfalls presented will help radiologists to better improve diagnosis of atypical appendicitis and guide clinical management.

Liver Sarcomas: Catching the Rare, Primary Hepatic Malignancies

LL-GIE2840
Benjamin D Godwin, MD
Marna J Eissa, MD
Orpheus Kolokythas, MD *
Carlos Cuevas, MD *

PURPOSE/AIM
1. To describe the variety of primary hepatic sarcomas
2. To discuss the imaging characteristics of the lesions using different imaging modalities.
3. To provide a diagnostic approach for liver masses suspicious for sarcoma.

CONTENT ORGANIZATION
1. Underlying pathology and associated clinical findings of the different hepatic sarcomas, including angiosarcoma, epithelioid hemangioendothelioma, leiomyosarcoma, undifferentiated embryonal sarcoma, and other rare sarcomas.
2. Imaging characteristics on ultrasound, CT, and MRI.
3. Differential diagnoses and appropriate further management.

SUMMARY
Upon review of the exhibit, the reader will:
1. Become familiar with the diverse primary hepatic sarcomas.
2. Be able to identify the key radiologic features that characterize each sarcoma type.
3. Be able to form an appropriate differential diagnosis, and to recognize when there is a need for additional diagnostic workup.

Intussusception: Spectrum of Imaging Features and Role in Treatment

LL-GIE2841
Sachin S Kumbhar, MBBS
Santosh B Rathod, MBBS
Lalit Garg
Shailendra Walunj
Aman Kumar, MBBS, MD

PURPOSE/AIM
Intussusception is a common cause of intestinal obstruction. The purpose of this exhibit is to review the spectrum of imaging appearances of intussusceptions on plain radiographs, Barium enema, US and CT, and discuss the role of imaging in their treatment.

CONTENT ORGANIZATION
1. Enunciating the etiology, pathogenesis and presentation of intussusception. 2. Reviewing the spectrum of their imaging characteristics on conventional radiographs, Barium enema, US and CT. 3. Discussing the role of imaging in the treatment of intussusception.

SUMMARY
After completion of this educational exhibit, one would have learnt:
1. The pathophysiology and clinical features of intussusception. 2. The entire spectrum of imaging appearances of intussusception. 3. The role of radiology in the treatment of this pathology.

Imaging of Crohn’s Disease: A Review with Emphasis on CT and MR Enterography

LL-GIE2842
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Agnes M Guthrie, MD
Larry A Kramer, MD

PURPOSE/AIM
To illustrate CT and MR Enterographic techniques, imaging appearances of disease subtypes, complications and performance of these modalities in different clinical scenarios in patients with Crohn’s disease.

CONTENT ORGANIZATION
1. Describe the clinical classification and pathologic basis of imaging manifestations of Crohn’s disease.
2. Describe CT and MR Enterographic (CTE and MRE) techniques including the utility of each sequence on MRE.
3. Illustrate CTE and MRE Imaging appearance of disease subtypes including active inflammatory, Fistulizing and penetrating, Fibrostenotic, Reparative and regenerative stages, complications and extraintestinal manifestations.
4. Illustrate performance of CTE and MRE in relation to clinical presentation such as initial diagnosis, assessing flare, differentiating active disease form fibrosis and scarring in obstructing lesions.
5. Describe advantages and disadvantages, limitations of CTE and MRE including comparison with capsule endoscopy.

SUMMARY
CTE and MRE demonstrate wide range of imaging appearances in patients with Crohn’s disease depending on the pathologic stage, presentation and are useful in initial diagnosis, differentiating active disease form fibrosis and scarring in obstructing lesions and to diagnose complications. This information in turn is critical in making treatment decisions.

Target-appeared Bowel Wall Thickening on CT: Imaging Spectrum and Differential Diagnosis with Emphasis on Pathogenesis and Radiologic-Pathologic Correlation

LL-GIE2843
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Ah Young Kim, MD
Jin Kyoo Jang, RT
Hyun Jin Kim, RT
Seong Ho Park, MD *
Jong Seok Lee
Hyun Kwon Ha, MD

PURPOSE/AIM
1. To learn the spectrum of gastrointestinal tract diseases presenting “target appearance” of bowel wall thickening on CT.
2. To understand characteristic CT findings of each disorder in correlation with pathogenesis.
3. To establish a radiologic perspective on the differential diagnosis by means of a systematic approach.

CONTENT ORGANIZATION
A. Background of “Target” sign in bowel wall thickening
- History and present meaning
- Pathogenesis and radiologic-pathologic correlation in various diseases
B. Disease Spectrum of Target-sign bowel wall thickening, focusing on clinical significance and differential diagnosis
1. Benign conditions
- Imaging features with radiologic-pathologic correlation
- Handy tips for differential diagnosis
2. Malignant conditions
- Imaging features with radiologic-pathologic correlation
- Handy tips for differential diagnosis
C. Potential pitfalls in CT assessment for bowel wall thickening
- Technical issues and performance for bowel imaging
D. Suggestions for systematic approach in differential diagnosis

SUMMARY
Full knowledge about target-appeared bowel wall thickening, based on pathogenesis and imaging-pathologic correlation, can improve the diagnostic performance of CT scan and prevent misdiagnosis.

CT Gastrography: Imaging-Pathologic Correlation of Various Gastric Diseases

LL-GIE2844
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Ah Young Kim, MD
Jin Kyoo Jang, RT
Hyun Jin Kim, RT
Seong Ho Park, MD *
Jong Seok Lee
Hyun Kwon Ha, MD

PURPOSE/AIM
In this article, we will demonstrate imaging-pathologic correlation of various gastric diseases detected on CT gastrography (CTG) and deal with its diagnostic role. And also, we will discuss how to obtain optimal imaging and how to avoid diagnostic pitfalls.

CONTENT ORGANIZATION
We will show characteristic imaging features of various gastric diseases on CTG [Benign conditions including various inflammation, ectopic pancreas with/without complication, gastritis cystic profunda, varix, volvulus, hernia, and Crohn’s disease/ Malignant diseases], focusing on imaging-pathologic correlation in order to improve the diagnostic performance as compared with axial CT scan, fluoroscopic and/or endoscopic examination. And also we will provide CT scan techniques and imaging reconstruction tools to obtain an optimal imaging. Finally we will discuss potential diagnostic pitfalls of CTG to avoid misdiagnosis.

SUMMARY
The major teaching points of this exhibit are:
1. Awareness of various gastric pathologic conditions detected on CTG can improve the diagnostic performance of CT in patients with suspected gastric disease.
2. Optimizing CT scanning and imaging reconstruction techniques can enhance the diagnostic accuracy of CTG for gastric diseases.
3. Comprehensive understanding for potential diagnostic pitfalls of CTG can avoid misdiagnosis.

Hepatic Perfusion Disorders during Infectious Diseases

LL-GIE2845
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Sarah Derhy
Sanaa El Mouhadi, MD
Marianne Hodoul, MD
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PURPOSE/AIM
To analyse the different patterns of hepatic perfusion disorders observed during infectious diseases.

CONTENT ORGANIZATION

SUMMARY
Hepatic perfusion disorders, in the case of infectious diseases, can be induced by different pathophysiologic mechanisms:
1) changes regarding the arterioportal perfusion balance of the liver (i.e. acute hepatitis, acute cholangitis, septic shock)
2) portal obstruction (i.e. pylephlebitis, hepatic abscess)
3) increase in arterial inflow caused by inflammation of adjacent organs (i.e. acute cholecystitis)
4) decrease or stoppage of the portal blood flow which is caused by extrinsic compression (as in Fitz-Hugh-Curtis syndrome or peritoneal tuberculosis)
5) hepatic sinusoidal dilatation or sinusoidal obstruction syndrome (SOS) with a global reticular or mosaic appearance of hepatic parenchyma (i.e. acute pyelonephritis, salpingitis, appendicitis)
A Wolf in Lamb’s Skin: Malignant Tumors Presenting as Inflammatory Conditions in Abdomen and Pelvis

Seong Jong Yun
Sang Won Kim, MD
Hyun Cheol Kim
Dal Mo Yang

PURPOSE/AIM
1. To illustrate cases of malignant tumors that present with inflammation.
2. To discuss the patterns and diagnostic clues that allow making a diagnosis of underlying malignancies on imaging.

CONTENT ORGANIZATION
A. Patterns of malignancies that coexist with inflammation
B. Various tumors
1) Gallbladder cancer presenting as acute cholecystitis
2) Cystic duct cancer presenting as xanthogranulomatous cholecystitis
3) Periampullary/biliary cancer presenting as acute cholangitis or cholecystitis
4) Cholangiocarcinoma combined with recurrent pyogenic cholangitis
5) Pancreatic malignancy presenting as acute pancreatitis
6) Bowel malignancies presenting as panperitonitis: perforated adenocarcinoma, GIST, and lymphoma
7) Gastric cancer combined with gastritis
8) Colorectal cancers presenting as various inflammatory conditions: acute appendicitis, ischemic colitis, stercoral colitis, and perianal abscess
9) Appendiceal malignancy presenting as acute appendicitis
10) Urinary bladder cancer combined with cystitis
C. Imaging clues to detect an underlying malignancy

SUMMARY
Combined inflammation frequently obscure underlying malignancies and can cause overstaging of tumors on imaging. Recognition of the potential tumors presenting as inflammatory conditions along with imaging features will facilitate a correct diagnosis of these entities.

Diverticular Disease of the Small Bowel CT Features

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Majdi Jaber
Samir Benadjaoud
Isabelle Boulay-Coletta, MD
Mathieu H Rodallec, MD
Marc Zins, MD

PURPOSE/AIM
To recognize and illustrate CT features of diverticular disease of the small bowel.

CONTENT ORGANIZATION
Small bowel diverticular disease is rare with a prevalence of 0.06-5%. Clinical symptoms are non-specific and diagnosis is often missed. Major complications include malabsorption, gastrointestinal bleeding, diverticulitis with or without acute perforation, with a high mortality rate. Complicated Meckel's diverticulum arise in young patients and include same complications. Imaging abnormalities are often missed, thus leading to delayed diagnosis and treatment. We will present 18 cases of complicated diverticula of the small bowel assessed with MDCT:

a) 8 cases of Meckel’s diverticula complicated with diverticulitis, small bowel obstruction with inverted Meckel diverticulum or related to a Meckel diverticulum band, perforated GIST (gastrointestinal stromal tumor) developed in a Meckel diverticulum
b) 10 cases of non Meckel small bowel diverticulum complicated with diverticulitis, perforation or acute haemorrhage

We will report useful tips to increase small bowel diverticulum detection, such as systematic use of multiplanar reconstruction.

SUMMARY
Small bowel diverticulum and Meckel diverticulum are challenging diagnosis. Common presentations and complications are important to detect in order to improve the patient management.

Atypical Imaging Presentations of Focal Nodular Hyperplasia with Radiologic Pathologic Correlation

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Sooyoung Shin, MD
Randy D Ernst, MD
Evelyne M Loyer, MD*
Thomas A Aloia, MD
Raju Sharma, MD
Haesun Choi, MD

PURPOSE/AIM
Review the typical and atypical imaging findings of FNH with particular emphasis on unusual enhancement patterns seen with liver specific contrast agents. We review the radio-pathologic correlation of imaging findings

CONTENT ORGANIZATION
Typical and atypical imaging appearances of FNH with extracellular and liver specific contrast agents are reviewed.
Liver Specific Contrast Agent such as Gadoxetic Acid and Gadobenate are increasingly used to characterize hypervascular lesions of the liver. Occasionally FNH can present with unusual imaging findings such as ring enhancing lesions with an iso or hypointense center, that are not widely recognized, leading to unneeded biopsies.
Radio-pathologic findings are reviewed with particular focus on FNH with uncommon or atypical radiologic presentations We propose a diagnostic algorithm for assessment of atypical lesions

SUMMARY
FNH may present with atypical radiologic findings which present a diagnostic challenge. It is important to recognize these patterns and the underlying pathology. FNH may have unique patterns of enhancement with liver specific contrast agents that should be recognized to avoid unnecessary biopsy.

Combined Low-kilovoltage Scan and Iterative Reconstruction at Dynamic Abdominal CT: Improved Image Quality and Reduced Radiation Dose

Sadahiro Yamamura
PURPOSE/AIM
1. To describe the basic effect of low-kilovoltage scan and iterative reconstruction on contrast-to-noise ratio and radiation dose reduction
2. To demonstrate the usefulness of combined low-kilovoltage scan and iterative reconstruction in oncologic patients of the liver and pancreas.

CONTENT ORGANIZATION
1. Principles of Iterative reconstruction algorithms on abdominal CT
   - First-generation iterative reconstruction
   - Hybrid iterative reconstruction
   - Knowledge-based iterative reconstruction (iterative model-based reconstruction)
2. Combined use with low-tube-voltage techniques
   - Reduction in radiation and contrast material dose
   - Protocol optimization
   - Effect on contrast-to-noise ratio and subjective image quality of abdominal cancers
3. Comparison between “low-kilovoltage plus iterative reconstruction” protocol and conventional protocol

SUMMARY
There are various effective ways to use low-kilovoltage CT scan with iterative reconstruction algorithm in oncologic patients of the abdomen. The technique can reduce the radiation and contrast material dose with improved image quality and diagnostic performance.
Syndromes with Gastrointestinal and/or Genitourinary Associations: A Comprehensive Imaging Review for Radiology Residents

**LL-GIE2853**
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Ryan B Peterson, MD
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Pardeep K Mittal, MD

**PURPOSE/AIM**
1. To review the multiple syndromes with associations/abnormalities of the GI and GU systems
2. To emphasize any malignancy or malignant potential associated with these syndromes
3. To review characteristic imaging findings of these syndromes with example cases

**CONTENT ORGANIZATION**
Multiple classic syndromes involve or have associated abnormalities of the GI and GU systems. Some syndromes are very rare such as Birt-Hogg-Dube syndrome or Maffucci syndrome, and most practicing radiologist may only see one of these cases during their career. However, some of the GI and GU associated abnormalities have important prognostic implications such as von Hippel-Lindau disease. Radiologists continue to have an essential role in monitoring and management of these patients. Therefore, it is essential for radiology residents to understand these syndromes. A collection of cases is presented as a comprehensive review. 1. Overview of syndromes with GI/GU involvement 2. Numerous example cases with key surveillance information for imaging these patients 3. Summary

**SUMMARY**
1. Many syndromes involve the GI and/or GU systems. 2. Radiology residents should be aware of these syndromes and any associated abnormality which may require imaging additional organ systems. 3. Residents and practicing radiologists should be knowledgeable of any associated malignancy or malignant potential.

Minimally Invasive Interventions in Complicated Pancreatitis: An Update

**LL-GIE2854**
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James Choi, MD
Amritia Sethi, MD
John Poneros, MD
Saravanan K Krishnamoorthy, MD

**PURPOSE/AIM**
Complications of pancreatitis remain a treatment challenge for clinicians. The revised Atlanta Classification allows for precise description of peripancreatic collections, which is particularly important, because treatment varies with collection type. Cyst-gastrostomy, percutaneous drainage, necrosectomy, and pancreatic duct stenting for ductal disruption are common interventions performed in these cases. This exhibit will illustrate the imaging appearance of pancreatic collections, with an emphasis on value added interpretations required as part of the multidisciplinary team. The exhibit will also review multiple minimally invasive interventions and their prognoses.

**CONTENT ORGANIZATION**
Clarify appropriate terms and imaging:
- Acute peripancreatic fluid collections
- Acute necrotic collections
- Pseudocysts
- Walled off Necroses

Review common minimally invasive interventions and their indications. Outcomes/prognosis after intervention.

**SUMMARY**
While medical management suffices for uncomplicated pancreatitis, select cases of complicated pancreatitis are best treated by minimally invasive interventions. This exhibit will serve to familiarize the radiologist with the array of fluid collections that can complicate the management of pancreatitis, a review of different interventions, and their morbidity/mortality.

Cross-sectional Imaging Spectrum of Hepatic Angiomyolipomas

**LL-GIE2855**
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**PURPOSE/AIM**
Hepatic angiomyolipoma (H-AML) is a rare mesenchymal neoplasm that belongs to a family of tumors called PEComas (perivascular epithelioid cell tumors). MDCT and MRI characteristics of triphasic and epithelioid H-AMLs will be reviewed.

**CONTENT ORGANIZATION**
- Definition and taxonomy of PEComas of the liver
- Epidemiological, clinical/pathological features (SMA, HMB-45 immunoreactivity), and natural history
- Imaging examples of classic (triphasic) H-AMLs with predominant fat.
- Epithelioid H-AMLs with minimal or no fat
- H-AML with large central and peripheral vessels versus focal nodular hyperplasia: value of Gadoxetate Disodium MRI
- H-AML versus hepatic cell carcinoma: lack of pseudocapsule with H-AML

**Conclusion**
H-AML’s are composed of lipomatous, myomatous, and angiomatous components of variable proportions. H-AML’s are characterized by hypervascularity and the presence of large intratumoral/peritumoral vessels. The imaging findings of fat-predominant AMLs overlap with those of hepatocellular carcinomas/adenomas. The epithelioid (monotypic) variant is biologically aggressive with frequent local disease recurrence.

Malignant Tumors of the Small Bowel: CT Features with Pathologic Correlation

**LL-GIE2856**
Anh-Minh Chuong
Isabelle Boulay-Coletta, MD
Elodie Sibileau, MD

**PURPOSE/AIM**
Hepatic angiomyolipoma (H-AML) is a rare mesenchymal neoplasm that belongs to a family of tumors called PEComas (perivascular epithelioid cell tumors). MDCT and MRI characteristics of triphasic and epithelioid H-AMLs will be reviewed.

**CONTENT ORGANIZATION**
- Definition and taxonomy of PEComas of the liver
- Epidemiological, clinical/pathological features (SMA, HMB-45 immunoreactivity), and natural history
- Imaging examples of classic (triphasic) H-AMLs with predominant fat.
- Epithelioid H-AMLs with minimal or no fat
- H-AML with large central and peripheral vessels versus focal nodular hyperplasia: value of Gadoxetate Disodium MRI
- H-AML versus hepatic cell carcinoma: lack of pseudocapsule with H-AML

**Conclusion**
H-AML’s are composed of lipomatous, myomatous, and angiomatous components of variable proportions. H-AML’s are characterized by hypervascularity and the presence of large intratumoral/peritumoral vessels. The imaging findings of fat-predominant AMLs overlap with those of hepatocellular carcinomas/adenomas. The epithelioid (monotypic) variant is biologically aggressive with frequent local disease recurrence.
PURPOSE/AIM
The purpose of this exhibit is to:
1. describe how to perform a CT examination when a small bowel tumor is suspected
2. review the characteristic CT features of the main malignant tumors of the small bowel
3. understand the CT findings thanks to the pathologic correlation

CONTENT ORGANIZATION
1. Epidemiology and clinical considerations
2. Technical management of CT-enteroclysis
3. CT features of primary and secondary malignant tumors of the small bowel with gross pathologic and histologic correlation

SUMMARY
1. The five most common malignant tumors are: lymphomas, adenocarcinomas, neuroendocrine tumors, gastro-intestinal stromal tumors (GISTs) and metastases.
2. The CT-enteroclysis is the first imaging modality to perform if a small bowel neoplasm is suspected as it is effective not only to detect and characterize the tumor but also to explore the metastatic disease.
3. Although the differential diagnosis for a small bowel tumor is extensive, various small bowel neoplasms have characteristic features at CT that may help making a diagnosis.
4. Pathologic findings are useful to understand the CT features of these tumors.

MRI of Pancreatic Adenocarcinoma: A Main Course or Just a Side Dish?

LL-GIE2857
Souha Ben Dhia
Elodie Sibileau, MD
Samir Benadjaoud
Jerome Hodel
Mathieu H Rodallec, MD
Marc Zins, MD

PURPOSE/AIM
- To review the MRI protocol in assessment of pancreatic tumors
- To describe and illustrate MRI features in preoperative staging of pancreatic cancer
- To discuss the advantages and remaining limitations of MRI in the detection and the staging of pancreatic cancer compared to MDCT

CONTENT ORGANIZATION
- Epidemiology and presentation
- MRI protocol (1.5T and 3T) in the study of pancreatic tumors
- MRI features in detection and assessment of resectability of pancreatic adenocarcinoma with pathologic correlation
- Respective advantages and limitations of MDCT and MRI in detection and staging

SUMMARY
Although CT remains the main technique used for detection and staging of pancreatic carcinoma, MRI can play a major role, mainly in case of isoattenuating lesion at CT. The sequences that are most helpful for the detection of pancreatic carcinoma are the T1-weighted fat-suppressed and gadolinium-enhanced sequences. MRCP is mandatory for accurate assessment of the pancreatic and biliary ducts. MRI has a superior soft-tissue contrast compared with CT, which makes it useful in the detection of non-contour deforming pancreatic masses. MRI thanks to DWI is also more sensitive in the detection of distant disease such as small liver metastases, lymph nodes and peritoneal metastases. MRI is recommended in all patient with pancreatic adenocarcinoma presumed resectable at CT.

Meckelâ€™s Diverticula and Its Complications: With Specific Focus on MRI

LL-GIE2858
Gerdien Kramer, MD
Rinze Reinhard, MD
Martin Heitbrink, MD
Bart M Wiarda, MD
Jan Hein Van Waesberghem, MD, PhD

PURPOSE/AIM
- Explain embryological origin of Meckel’s diverticula.
- Review imaging characteristics and complications of Meckel’s diverticula.
- Show an overview of different complications of Meckel’s diverticula using different imaging modalities.
- Specific focus on presentation of Meckel’s diverticula using MR imaging.

CONTENT ORGANIZATION
MCA Alkmaar, the Netherlands VUMC Amsterdam, the Netherlands

SUMMARY
Meckel’s diverticulum is the most common congenital anomaly of the gastrointestinal tract, occurring in 2%–3% of the population. It results from improper closure and absorption of the vitelline duct. Clinical symptoms arise from complications of the diverticulum such as peptic ulceration with hemorrhage; formation of enteroliths; diverticulitis; intestinal obstruction from diverticular inversion, intussusception, volvulus, or inclusion of the diverticulum in a hernia; and although rare development of neoplasia within the diverticulum.

The diagnosis of a Meckel’s diverticulum on imaging can be challenging and is rarely made preoperatively. More wide availability of MR imaging renders new opportunities for finding clues for complications related to Meckel’s diverticula. In this educational exhibit we provide an overview of common presentations of Meckel’s diverticula using MRI, CT and Tc-99mTc-99m pertechnetate scintigraphy.

Treatment Planning for Gastric Cancer: The Role of CT Gastrography

LL-GIE2859
Seishi KUMANO, MD
Takamichi Murakami, MD, PhD *
Takahiro Tsuboyama, MD
Hiroshi Juri
Kazuhiro Yamamoto, MD
Yoshifumi Narumi, MD

PURPOSE/AIM
The purpose of this exhibit is:
1. to overview the method and advantage of CT gastrography technique
2. to demonstrate the CT staging criteria of gastric cancer with CT gastrography according to the 7th edition of AJCC tumor staging system
3. to discuss the role of CT gastrography for the treatment algorithm based on AJCC TNM staging system

CONTENT ORGANIZATION
Pictorial Review: Whole Body Fusion Imaging between Diffusion-weighted Imaging and 3D Fat Suppressed Contrast-enhanced T1-weighted Imaging (FDWI)

This exhibit will provide a utility of the whole body FDWI. The major teaching points of this exhibit are: 1) To describe the technique of whole body fusion imaging between diffusion-weighted imaging and 3D fat suppressed contrast-enhanced T1-weighted imaging (FDWI). 2) To illustrate the T, N, and M staging of gastrointestinal cancers using whole body FDWI. 3) To review the various recurrent lesions and distant metastases of cancers using whole body FDWI.

SUMMARY

The content organization of this exhibit is: 1) Method and advantage of CT gastrography, a) water-filling (hydro) CT, b) air-filling CT, c) 2D MPR image, d) virtual endoscopy technique, 2) CT staging criteria of gastric cancer with CT gastrography according to the 7th edition of AJCC tumor staging system compared to the 6th edition, including the following changes as new classification, T1 on the 6th edition is divided into T1a (mucosa) and T1b (submucosa) on the 7th edition, T2 on 6th edition is divided into T2 (proper muscularis) and T3 (subserosa), 3) CT gastrography for treatment algorithm (endoscopic resection, laparoscopic surgery, standard open surgery, neoadjuvant chemotherapy) based on AJCC TNM staging system, including nodal and distant metastases evaluation.

Pelvic Floor MRI for Fecal Incontinence: What the Surgeon Needs to Know

LL-GIE2860

Andrew Ho, MD
Amanda Fowler, MD
Angus J Hartery, MD
Connie A Haggood, MD

PURPOSE/AIM

Case based review of several pelvic floor MRIs in patients with fecal incontinence. Interpretation will focus on what the surgeon needs to know including how MRI might function as a potential predictor of outcome.

CONTENT ORGANIZATION

The cases will be presented in a quiz format. Key diagnostic points will be highlighted in the discussion for each case. The topics include: 1) Introduction and epidemiology of fecal incontinence, 2) Role of MRI in the diagnostic work up for fecal incontinence, 3) Pertinent pelvic MRI anatomy and what the surgeon needs to know, 4) Several cases will then be presented. The cases will be presented in a quiz format with varying degrees of fecal incontinence. 5) Pearls and Pitfalls.

SUMMARY

1. Fecal incontinence is a hidden epidemic, that is very prevalent in the population and has a significant impact on patient's quality of life.
2. There are a variety of management options for fecal incontinence, including surgery.
3. Pelvic MRI has an important role in guiding surgical management for fecal incontinence including potential predictor for surgical outcome.

Ectopic Splenic Tissue: Cross Sectional and Scintigraphic Imaging Findings in Typical and Rare Atypical Locations

LL-GIE2861

Ayman H Gaballah, MD, FRCR
Ehab H Youssef, MD, FRCR
Hatice Savas, MD
Peter S Liu, MD
Richard K. J. Brown, MD *
William J Weadock, MD *

PURPOSE/AIM

1) Review the common and uncommon locations of ectopic splenic tissue simulating thoracic and abdominopelvic masses
2) Discuss the pertinent cross sectional imaging findings of ectopic splenic tissue and relevant differential diagnosis
3) Correlate cross sectional imaging findings with scintigraphic and pathologic findings

CONTENT ORGANIZATION

1) Introduction
2) Embryology and anatomy of the spleen
3) Types and causes of ectopic splenic tissue
4) Diagnostic imaging findings– Relevant imaging findings in typical and atypical locations of ectopic splenic tissue will be reviewed using a case-based method, including discussion of appropriate differential diagnoses
5) Conclusion and take home points

SUMMARY

Ectopic splenic tissue can be found in the body as two distinct forms: congenital accessory spleens and acquired splenosis. In splenosis, autotransplantation of viable splenic tissue throughout different anatomic compartments of the body can occur after traumatic or iatrogenic rupture of the spleen. Detection and characterization of ectopic splenic tissue is important to avoid misinterpreting these lesions as enlarged lymph nodes, thoracic or abdominopelvic tumors. Radiologists should be familiar with the imaging appearances of these lesions to avoid unnecessary surgery or interventions.

Pictorial Review: Whole Body Fusion Imaging between Diffusion-weighted Imaging and 3D Fat Suppressed Contrast-enhanced T1-weighted Imaging (FDWI)

LL-GIE2862

Hiroyuki Horikoshi, MD
Aya Okayama, MD
Takeki Kawakami, MD
Tsukasa Akiyoshi, MD, PhD
Nariyuki Oya, MD, PhD
Michiko Kobayashi, MD

PURPOSE/AIM

The prognosis of patients with gastrointestinal cancer is dependent on the stage of disease at the time of diagnosis. Furthermore, early detection of recurrent lesions and distant metastases of gastrointestinal cancer is important for the planning of optimal therapy. The purpose of this exhibit is 1) To describe the technique of whole body fusion imaging between diffusion-weighted imaging and 3D fat suppressed contrast-enhanced T1-weighted imaging (FDWI), 2) To illustrate the T, N, and M staging of gastrointestinal cancers using whole body FDWI, 3) To review the various recurrent lesions and distant metastases of cancers using whole body FDWI.

CONTENT ORGANIZATION

The content organization of this exhibit is: 1) Imaging technique in whole body FDWI. 2) Imaging of the T, N, and M staging of gastrointestinal cancers using whole body FDWI. 3) Review of the various recurrent lesions and distant metastases of cancers using whole body FDWI.

SUMMARY

This exhibit will provide a utility of the whole body FDWI. The major teaching points of this exhibit are: 1) whole body FDWI is useful for the T, N, and M staging of gastrointestinal cancers. 2) The review of various recurrent lesions and distant metastases of cancers using whole body FDWI.

Ulcerative Colitis: What Should Radiologists Know?

LL-GIE2863

Nariyuki Oya, MD
Takeshi Kawakami, MD
Aya Okayama, MD
Hiroyuki Horikoshi, MD

PURPOSE/AIM

T1-weighted imaging (FDWI). Pictorial review: Whole body fusion imaging between diffusion-weighted imaging and 3D fat suppressed contrast-enhanced T1-weighted imaging (FDWI) based on AJCC TNM staging system, including nodal and distant metastases evaluation.
The aim is to describe imaging contribution at the different stages of management of ulcerative colitis (UC).

**CONTENT ORGANIZATION**

Pathophysiology of UC.

Review of imaging modalities which play a role in UC with a special attention to CT and MR imaging:

- Besides the major role of endoscopy, CT and MR imaging can play a role in diagnosis.
- CT and MR imaging are valuable in assessing disease activity which could influence medical and surgical management.
- In complicated UCs, CT is a reliable tool to diagnose toxic megacolon, colonic perforation, and other complications.
- After subtotal colectomy, rectal imaging (looking for microrectum) allows to choose between ileorectal or ileal pouch-anal anastomosis.
- CT scan can depict postoperative complications.
- Interventional radiology (with CT or US/scopy guidance) can be performed to manage these complications.

Many examples will be shown to illustrate the various indications of CT and MR imaging in UC.

**SUMMARY**

CT and MR imaging are often indicated in UC. CT is the best imaging modality to diagnose acute complications of UC. MR colonography seems to be a good tool to evaluate disease activity. CT is reliable to assess rectum before surgical decision. CT is the best examination to depict surgical complications which can be treated radiologically.

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**The Forgotten Small Intestinal Follow-through (SBFT): How and a Guide to Inflammatory, Infectious and Oncologic Findings**

**LL-GIE2864**

Walid Mnari, MD
Mezri Maatouk, MD
Ahmed Zrig, MD
Badii Hmida
Wissem Melki
Mondher Golli, MD

**PURPOSE/AIM**

The aim of this poster is to review the small intestinal follow-through (SBFT) technique and the common imaging findings in inflammatory, infectious and oncologic disease.

**CONTENT ORGANIZATION**

A) Technique

B) Findings

a) Inflammatory: 1) Crohn 2) Celiac disease 3) Diverticulitis 4) Polyposis 6) Other

b) Infectious: 1) Tuberculosis 5) Other


**SUMMARY**

SBFT is still a good low cost study for small intestinal disease. Double contrast is essential for a good diagnosis. A disorder involving the mucosa or sub mucosa, intestinal peristaltis, space between small bowel loops, disrupts the normal pattern suggesting disease.

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**The Many Faces of Cholangiocarcinoma. A Pictorial Review of the Spectrum of RI Findings with Pathologic Correlation**

**LL-GIE2865**

Mercedes Arias
Alfonso Iglesias, MD, PhD
Cristina Ruibal
Marta Herreros, MD
Rebeca Fernandez Victoria
Fabio Ausania

**PURPOSE/AIM**

To describe the clinical and pathological features of cholangiocarcinoma

To provide an image overview of MRI findings of typical and unusual appearances of cholangiocarcinoma

To describe and illustrate the most frequent morphologic and dynamic patterns which help to make correct diagnosis

To discuss the differential diagnosis and potential pitfalls

**CONTENT ORGANIZATION**

Definition, epidemiology, clinical, laboratory, gross and microscopic findings

Discuss the spectrum of typical and atypical findings of cholangiocarcinoma and to emphasize about clues which suggest their diagnosis

Review the differential diagnosis and potential pitfalls

**SUMMARY**

MR imaging plays an essential role in the diagnosis, anatomic localization and surgical planning.

It is important for a radiologist to know the disease spectrum of cholangiocarcinoma for an accurate interpretation and diagnosis.

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**Multidetector Computed Tomography (MDCT) and MRI Findings before and after Pancreatectomy and Islet Cell Transplantation for Chronic Pancreatitis**

**LL-GIE2866**

Maera Haider, MBBS, MD
Vikesh Singh, MD
Martin Makary, MD
Elliot K Fishman, MD
Atif Zaheer, MD

**PURPOSE/AIM**

To illustrate various methods of pancreatic surgery for chronic pancreatitis (CP describe pre-operative MDCT and MRI and post-operative and follow-up MDCT findings of patients undergoing pancreatectomy and auto islet cell transplantation.

**CONTENT ORGANIZATION**

1. Indications for surgery for patients with CP.
2. Types of pancreatectomy (Whipple, Berger, Frey’s) with illustrative descriptions.
3. Technique of auto-islet cell transplantation.
4. Imaging findings before, after and on long-term follow-up of pancreatic surgery on MRI and MDCT.

**SUMMARY**

There has been recent renewed interest in pancreatectomy and islet cell transplantation. Familiarity with MRI and MDCT findings of chronic
Pancreaticoduodenectomy: Normal Post-operative Anatomy and Hepatobiliary/Vascular Complications

**PURPOSE/AIM**
1. To review the role of CT in the preoperative staging and restaging of Gastric Cancer after neoadjuvant therapy.
2. To learn the MDCT criteria and findings of Gastric Cancer invasion with particular attention to T staging and lymphonodal spread.
3. To learn the utility of preoperative definition of maximum tumour diameter (Dmax) in patients with Gastric Cancer.
4. To discuss the optimal CT technique in the preoperative staging of Gastric Cancer.

**CONTENT ORGANIZATION**
1. Therapeutic strategies for Gastric Cancer in the era of neo-adjuvant chemotherapeutic treatment.
2. CT findings of T staging and lymphonodal spread in Gastric Cancer, before and after neoadjuvant therapy, and its correlation with pathologic specimens.
3. CT definition of maximum tumour diameter (Dmax) and its correlation with surgical specimens, according to Lauren Classification.

**SUMMARY**
1. The therapeutic strategies for Gastric Cancer are changing in the last years thanks to the introduction of neoadjuvant treatment in advanced forms.
2. Recognising CT findings useful to define T staging or the presence of lymph node metastasis can improve the selection of patients eligible for neoadjuvant protocols.
3. The preoperative measurements of Dmax can simplify the definition of T staging.
4. Optimizing CT techniques can improve the accuracy in T and lymphonodal staging in Gastric Cancer.

**Tips and Tricks: Optimizing Parameters for Abdominal Dual Source Dual Energy CT (DECT) Imaging Acquisition and Reconstruction**

**PURPOSE/AIM**
To illustrate the importance of multiple adjustable parameters in the performance of high quality DECT and the reconstruction of diagnostic, accurate and artefact free material specific imaging.

**CONTENT ORGANIZATION**
With regard to DECT for the availability of low and high kVp spectral interpretation data sets or to reconstruct iodine selective, virtual non-contrast, bone subtracted or stone characterization images the following parameters are considered for 1st and 2nd generation systems:

**Acquisition:**
- Choice/rationale of specific high-low kVp pairs as per size/indication.
- Radiation dose distribution (high-low kVp Tube A/B assignment)
- Contrast volume/rate, flush, timing, bolus tracking
- Scouts/isocentering
- Collimator/pitch settings to internally correct noise and improve DECT calculation

**Reconstruction:**
- Kernels and thickness data/overlap choice for accurate DECT analysis
- Advanced parameters (substance definitions, contrast media cutoff, range, relative contrast media values) – leave alone or adjust?
- Weighting factors adjusted for kVp pairs, sigmoidal blending, monoenergetic imaging
- Improved long segment coronal/sagittal reconstruction

**SUMMARY**
This exhibit provides a user’s guide for abdominal dual source dual energy imaging acquisition and reconstruction parameters to reliably improve image quality and interpretation.

**Pancreatoduodenectomy: Normal Post-operative Anatomy and Hepatobiliary/Vascular Complications**

**PURPOSE/AIM**
Pancreatoduodenectomy is a complex, high risk surgical procedure. The rate of perioperative mortality has decreased in the last number of years but perioperative morbidity remains high. Familiarity with the normal anatomic findings is essential to distinguish expected post-operative change from surgical complications or recurrent disease.

**CONTENT ORGANIZATION**
1. Illustration of expected findings in early and late post-operative periods, including mimickers of pathology
2. Review of surgical complications including postoperative collections, pancreatic fistulae and bilomas, vascular complications including haemorrhage and ischemia, biliary strictures, hepatic abscesses and rarer complications including pancreatic stent migration
3. Options for minimally invasive image-guided management of vascular and hepatobiliary complications

**SUMMARY**
This exhibit summarizes the normal and abnormal radiological findings following pancreatoduodenectomy. Knowledge of available image-guided interventions allows prompt triage of patients to appropriate management pathways.
LL-GIE2870
Ciaran E Redmond, MBCh
Sinead H McEvoy, MBCh, FFRRCSI
Lisa P Lavelle, MBCh
Dermot O'Toole, MD
Niall Swan
Stephen J Skehan, MBCh
Jeffrey W McCann, MBCh, MSc
Edmund Ronan Ryan, MBCh
Colin P Cantwell, MD

PURPOSE/AIM
1. To illustrate the imaging characteristics of Borderline Resectable Pancreatic Adenocarcinoma.
2. To demonstrate imaging features that have significant implications for surgical planning.
3. To highlight the role and limitations of radiological evaluation following neoadjuvant chemoradiotherapy.

CONTENT ORGANIZATION
- Description of resectability criteria as defined in the National Comprehensive Cancer Network (NCCN) Guidelines.
- Imaging characteristics of Borderline Resectable Pancreatic Cancer on MDCT, with Endoscopic Ultrasound (EUS) correlation.
- Discussion of treatment options for this patient group.
- Review of imaging findings following neoadjuvant chemoradiotherapy with histopathological correlation where appropriate.
- Case based self-assessment quiz.

SUMMARY
Patients with Borderline Pancreatic Cancer may potentially receive surgical therapy after successful neoadjuvant chemoradiotherapy. Our exhibit describes the detailed evaluation of MDCT and Endoscopic Ultrasound in the primary selection of cases and evaluation of treatment response.

LL-GIE2871
Violette S Cohen-Hallaleh, MBBS
Michelle T Ong, MBBS
Ehsan A Haider, MBBCh
Ryan P Rebello, MD

PURPOSE/AIM
1. Discuss the ways to assist in identifying whether a mass is intraperitoneal or retroperitoneal in location.
2. List differentials for non-ovarian intraperitoneal and retroperitoneal cystic pelvic masses.
3. Focus on the key imaging features of the different non-ovarian pelvic cystic masses

CONTENT ORGANIZATION
Through a number of radiology cases the reader is provided with an approach to accurately diagnose non-ovarian cystic masses. The cases in the presentation include peritoneal inclusion cyst, paraovarian cyst, hematosalpinx, lymphoceles, unicornuate uterus with an obstructed horn, a retrorectal cyst, urethral diverticulum, presacral space and lymphatic and vascular system is a vital key in reaching a more accurate diagnosis.

SUMMARY
Most cystic lesions in the pelvis arise from the ovaries but non-ovarian cystic pathologies do occur. Knowledge of the different non-ovarian intraperitoneal and retroperitoneal pelvic cystic masses and their key imaging features will assist in determining the most accurate diagnosis.

LL-GIE2872
Cesar A Lam, MD
Joseph J Budovec, MD
Parag P Tolat, MD
Mario A Laguna, MD
Melissa S Dubois, MD
Dhiraj Baruah, MD

PURPOSE/AIM
While, adenocarcinoma is the fourth most common cause of cancer-related deaths in the US and accounts for 95 percent of pancreatic cancers, pancreatic metastasis is rare, accounting for 2%-5% of all pancreatic malignant tumors. Differentiating metastatic disease from adenocarcinoma is of upmost importance as treatment options and survival rates greatly differ. The most common primary tumor to metastasize to the pancreas is renal cell carcinoma (30%), followed by lung carcinoma (23%) and in descending order: breast, colorectal, malignant melanoma and leiomyosarcoma. The purpose of this exhibit is to review the etiology and different imaging characteristics of common and uncommon primary pancreatic metastatic tumors.

CONTENT ORGANIZATION
1. Epidemiology of the primary tumors that metastasize to the pancreas
2. Clinical Presentation
3. Imaging Protocols
4. Multimodality Imaging findings

SUMMARY
Pancreatic metastatic disease is relatively uncommon. When present, however, the non-specific appearance of metastatic tumors can make the differentiation from adenocarcinoma difficult. Therefore, familiarization with the common and uncommon primary metastatic tumors, clinical presentation, proper imaging techniques, and typical imaging findings is critical for accurate diagnosis.

LL-GIE2873
Harshawn Malhi, MD
Bhushan Desai, MD
John R Daniels, MD
Edward G Grant, MD

PURPOSE/AIM
1. To understand the basics of contrast enhanced ultrasound (CEUS). 2. To investigate the ability of CEUS in assessing response of TACE treated liver masses using modified RECIST criteria and determine if CEUS can be used as a legitimate alternative to CECT. 3. To evaluate the diagnostic utility of CEUS in detection and characterization of additional (non-treated) lesions which may develop in the liver during TACE.
Advanced Multimodality Imaging of the Appendix - Taking It to the Stump

**PURPOSE/AIM**
Although appendicitis is the most common surgical emergency numerous other disease entities may also involve the appendix. The purpose of this exhibit is to review the multimodality imaging of appendiceal disorders, focusing on advanced multimodality imaging techniques and illustrating the value of these techniques in the assessment of the abnormal appendix.

**CONTENT ORGANIZATION**
1. Ultrasound, CT and MRI are frequently used in the diagnosis and exclusion of appendicitis and in the diagnosis of other pathologies involving the appendix. We will review cases of acute and chronic appendicitis on all modalities, with emphasis on the use of color Doppler, advanced CT techniques, multiplanar curved reformattting, and diffusion weighted imaging. 2. Inflammatory conditions mimicking appendicitis including Crohn's disease and endometriosis will also be reviewed. We will evaluate neoplastic lesions of the appendix including carcinoid, mucinous cystadenoma, metastasis, and appendiceal adenocarcinoma tumors. Finally we will illustrate types of appendiceal hernia, such as Amyand and De Gerangeot hernias.

**SUMMARY**
Multimodality imaging is frequently used in the diagnosis of appendicitis and in the exclusion of other pathologies, both inflammatory and neoplastic. This review aims to highlight modern imaging techniques which can aid the radiologist in the diagnostic process.

Contrast Enhanced Body Ultrasound, A Step Up in Further Characterization

**PURPOSE/AIM**
The purpose is to demonstrate body imaging examples of the application and utility of contrast addition to diagnostic ultrasound.

**CONTENT ORGANIZATION**
1. Cases in which contrast addition aided in further characterization of hepatic lesions. 2. Evaluation of intestinal disorders such as inflammatory bowel disease. 3. Improved characterization of renal lesions. 4. Evaluation of pelvic gynecologic malignancies. 5. Vascular enhancement during ultrasound guided procedures to prevent risk of vascular puncture and resulting hemorrhage. 6. Ultrasound contrast, microbubbles, may be used in patients with contraindication to iodinated contrast.

**SUMMARY**
Contrast enhanced ultrasound with microbubbles can aid in further characterization of multiple abdominopelvic lesions. Lesions that normally would require contrast enhancement with CT or MR, can be characterized by contrast enhanced ultrasound without worrying for the risks involved with iodinated contrast.

How to Capture Pathology of the Elusive C Loop of the Duodenum: A Modality Approach

**PURPOSE/AIM**
1. Describe the normal imaging appearance of the duodenum and identify the strengths and limitations of various imaging modalities in the evaluation of duodenal pathology. 2. Present the spectrum of duodenal pathology in terms of the imaging modalities best suited for evaluation of different pathological entities.

**CONTENT ORGANIZATION**
1. Duodenal embryology/anatomy and normal imaging appearance on each modality including fluoroscopy, Ultrasound/Endoscopic ultrasound, CT and MRI. 2. Spectrum of duodenal pathology including congenital anomalies, inflammatory/infectious/neoplastic entities, trauma, iatrogenic/post-operative complications and periduodenal pathologies affecting the duodenum. 3. Role of each imaging modality in evaluation of duodenal pathology.

**SUMMARY**
The evaluation of the duodenum is both difficult and time consuming secondary to its close proximity to other organs and the non specificity of symptoms. A review of the spectrum of duodenal pathology and the associated key imaging findings on the various modalities will help the radiologist arrive at a reasonable differential diagnosis. Additionally, an awareness of the strengths and limitations of various imaging modalities will help the radiologist guide the clinician in the appropriate work up of a patient with suspected or known duodenal pathology.

A Journey through the Bile Ducts: Multimodality Imaging Review of Acquired Biliary Tract Pathology

**PURPOSE/AIM**
To illustrate various clinical cases where CEUS provides complimentary and supplementary information to conventional imaging data.

**CONTENT ORGANIZATION**
I. Background and Significance
II. Literature review
III. TACE protocol
IV. Contrast enhanced CT scanning protocol
V. Limitations of conventional imaging modalities
VI. Clinical utility of CEUS
VII. Technical note: Ultrasound with intravenous contrast injection
VIII. Ultrasound Contrast Agents
IX. Pictorial cases

**SUMMARY**
The major teaching points of this exhibit are:
1. CEUS allows for reliable and immediate assessment of the therapeutic efficacy after TACE procedure for HCC. 2. CEUS constitutes an alternative to CECT, resulting in decreased patient ionizing radiation and iodinated contrast exposure as well as lower overall costs.
Roshni Patel, MBBS, MRCS
Silvia D Chang, MD
Alison C Harris, MBChB

PURPOSE/AIM
The purpose of this educational exhibit will be to present a multimodality imaging review of acquired biliary tract pathology, as well as to provide a practical imaging algorithm for assessment of suspected biliary pathology.

CONTENT ORGANIZATION
1. Briefly review the indications and technique for use of ultrasound, CT, MRI, MRCP, and ERCP with respect to biliary imaging. 2. Review the imaging features of: a. Choledocholithiasis and its sequelae, including biliary strictures, Mirrizi's syndrome, and cholecysto-enteric fistulae. b. Infectious cholangitides, including recurrent pyogenic cholangitis and acute suppurative cholangitis. c. Inflammatory cholangitides, including primary sclerosing cholangitis and autoimmune pancreatitis related cholangitis. d. Neoplasms affecting the biliary system, including cholangiocarcinoma and biliary IPMN. 3. Present a multimodality imaging algorithm for the assessment of suspected biliary tract pathology.

SUMMARY
A wide spectrum of pathologic entities can affect the biliary tract and investigation often requires a multimodality approach. We have reviewed the imaging appearances of common acquired biliary tract pathologies, including calculous, infectious, inflammatory, neoplastic processes.

Acute Mesenteric Ischemia: The Role of MDCT

LL-GIE2878
Seishi Kumano, MD
Yuki Inada
Mitsuhiro Koyama, MD
Masako Yuki, MD
Kazuhiro Yamamoto, MD
Yoshifumi Narumi, MD

PURPOSE/AIM
The purpose of this exhibit is:
(1) to review the pathophysiologic basis of acute mesenteric ischemia
(2) to illustrate the imaging features of mesenteric ischemia on MDCT
(3) to correlate the CT findings of various causes of bowel ischemia with surgical and pathologic findings

CONTENT ORGANIZATION
1. Pathophysiology of acute mesenteric ischemia
2. Imaging features of mesenteric ischemia
a) CT angiography, b) pneumatosis intestinalis, c) portal or mesenteric venous gas or thrombosis d) bowel wall thickening, e) decreased bowel wall enhancement
3. Correlation between the CT findings of various causes of bowel ischemia and pathologic findings
a) acute superior mesenteric arterial occlusion, b) mesenteric vein thrombosis, c) non occlusive mesenteric ischemia, d) ischemic colitis, e) strangulated bowel obstruction

SUMMARY
Acute mesenteric ischemia is an emergency clinical situation that requires a prompt diagnosis and treatment. CT findings were well correlated with surgical and histopathologic findings. For radiologist, key imaging findings of bowel ischemia must be recognized in order to expedite management.

Unusual Gallbladder Pathology: A Multimodality Review

LL-GIE2879
Michael H Raj, MD
Priya K Shah, MD
Gregory M Grimaldi, MD

PURPOSE/AIM
To review the imaging features of less commonly seen gallbladder pathology using a multimodality approach.
To recognize unusual manifestations of systemic disease when presenting in the gallbladder.
To highlight features that would suggest the need for further workup/intervention and to recognize gallbladder conditions that do not need further workup.

CONTENT ORGANIZATION
- The Anatomy of the Biliary System
- Multimodality Imaging of the Gallbladder
- Atypical Presentations of Cholecystitis
  1. Acalculous
  2. Emphysematous
- Masses in the Gallbladder
  1. Gallbladder varices
  2. Gallstones
  3. Adenomyomatosis
  4. Malignancy (primary and secondary)
  5. Porcelain gallbladder

SUMMARY
1. Intramural or intraluminal gas within the gallbladder indicates emphysematous cholecystitis and has specific imaging features on US, CT, and MR.
2. An echogenic focus in the wall of the gallbladder may be seen in the setting of emphysematous cholecystitis or porcelain gallbladder.
3. Assessing for mobility of a lesion is the first step in differentiating a gallbladder mass from a gallstone or tumefactive sludge.
4. Gallbladder varices are an indirect sign of portal vein thrombosis along with the more classic finding of cavernous transformation of the porta hepatis.

Born This Way: A Multimodality Imaging Review of Congenital Anomalies of the Biliary Tract

LL-GIE2880
Kelly A MacLean, MD
Abdominal Oncologic Applications of Dual Energy CT (DECT): Where Do We Stand?

**Erik K Paulson**, MD
**Naveen Garg**, MD
**Priya R Bhosale**, MBBS, FRCR
**Raghunandan Vikram**, MD
**Ajaykumar C Morani**, MD

**PURPOSE/AIM**
To describe the principles of Dual Energy CT (DECT) with illustrations of its applications in CT scans of the abdomen and pelvis in oncologic patients.

**CONTENT ORGANIZATION**
1. Principles and physics of DECT. Discussion on CTDI and dose reduction strategies.
3. Discussion of optimal keV in various settings including mesenteric and peritoneal metastases.
4. Pitfalls

**SUMMARY**
DECT is a relatively new technique with several advantages over conventional CT in oncologic settings. Low KeV monochromatic images improve tumor characterisation by increasing the conspicuity of hypervascular lesions and increasing the contrast to noise ratio for hypovascular and peritoneal lesions. Iodine maps increase the confidence in differentiating cysts and characterizing 'too small to characterize' lesions in addition to differentiation of tumor from bland thrombi and better presurgical planning. DECT may also hold promise in assessing adrenal lesions, tumor treatment response and detecting complications related to oncologic therapy.
Hiding in Plain Sight: The Importance of Proper Bolus Timing in Hepatic CT Imaging

Christopher C Connor, MD
Zachary T Boyd, MD
Ryan M Ash, MD
Shaun R Best, MD

PURPOSE/AIM
The purpose of this exhibit is to describe appropriate timing, appearance, and utilization of the key phases available for evaluation of the liver in abdominal CT in order to improve imaging quality and maximize discovery of hepatic lesions.

CONTENT ORGANIZATION
1) Provide ideal images of each phase of hepatic CT imaging, including pre-contrast, late hepatic arterial, portal venous, and equilibrium phases. 2) Detailed protocol for properly timing the contrast bolus with image acquisition. 3) Describe methods to ensure the various phases were timed appropriately when interpreting the images. 4) Describe appropriate utilization of contrast phases for lesion detection. 5) Provide images of biopsy confirmed lesions that become inconspicuous when an inappropriate contrast phase was utilized.

SUMMARY
CT is the mainstay used for evaluation of hepatic structures and lesions. Appropriately timed contrast administration with CT is essential for detecting and properly characterizing liver lesions. Our goal is to provide information to correctly develop imaging protocols for optimal detection of hepatic lesions. We will do this by providing examples of appropriately and inappropriately performed exams that highlight the potential to miss liver lesions. In practice, this will lead to an increased likelihood of detecting hepatic lesions and an improvement in patient care.

Surgical Emergencies of the Cecum on CT

Micheal H Raj, MD
Priya K Shah, MD

PURPOSE/AIM
To review the normal appearance of the cecum on CT.
To discuss different appearances of abnormal anatomic position of the cecum.
To recognize more worrisome findings that suggest the presence of obstruction and/or ischemia.

CONTENT ORGANIZATION
- The Normal Anatomy of the Cecum
- Abnormal Anatomic Position of the Cecum
  1. Hypermobile cecum
  2. Pericecal hernia
  3. Herniation of cecum into Foramen of Winslow
  4. Cecal Bascule
  5. Cecal Volvulus
- Cecal Trauma
  1. Hematoma
  2. Perforation
- Vascular Compromise of the Cecum
  1. Active bleeding from Cecum
  2. Ischemia

SUMMARY
The major teaching points of this exhibit are:
1. The presence of small bowel loops located lateral to the cecum and posterior to the ascending colon is suggestive of a pericecal hernia, whereas the absence of the cecum in the right paracolic gutter and presence of mesenteric vessels between the IVC and the main portal vein is characteristic of a hernia through the foramen of Winslow.
2. Unlike cecal volvulus, a cecal bascule does not involve twisting of the mesentery, but it can still cause bowel wall distension and ischemia.
3. Pneumatosis of the cecum is a nonspecific sign that signifies infarction in patients with colonic ischemia.

Review of the Clinical Importance of Misty Mesentery

Zachary T Boyd, MD
Christopher C Connor, MD
Benjamin P Saverino, MD
Rustain L Morgan, MD, MS
Ryan M Ash, MD

PURPOSE/AIM
The purpose of this exhibit is to review the imaging appearance and discuss the clinical significance of segmental and nonsegmental misty mesentery.

CONTENT ORGANIZATION
1) Describe and provide examples of segmental and nonsegmental misty mesentery. 2) Review the literature and summarize the potential risk of malignancy with the misty mesentery finding. 3) Discuss other benign causes of misty mesentery.

SUMMARY
Misty mesentery is a nonspecific imaging finding with an uncertain associated risk of malignancy and a variable description of its appearance. We will clarify the description and appearance of segmental and nonsegmental misty mesentery as well as review the recent literature highlighting the risk of underlying malignancy in these patients.

Autoimmune Pancreatitis, a Diagnostic Challenge: MR Imaging-A Problem Solving Tool with Histopathological Correlation

Sajeev R Ezhapilli, MBBS
Courtney A Coursey, MD
Bobby T Kalb, MD
William C Small, MD, PhD
Pardeep K Mittal, MD
Tips, Pitfalls and Tricks in Magnetic Resonance Imaging for Rectal Cancer: From Acquisition to the Report

- To review practical aspects in acquiring magnetic resonance imaging of rectal cancer and how to report findings.
- To discuss the various imaging findings of fatty changes on CT, US, and MRI.
- To explain the various imaging findings of pelvic floor dysfunctional conditions.
- To discuss pertinent imaging pearls and pitfalls, emphasizing cases where findings are equivocal and follow-up imaging is required.
- To describe stress relevant clinical information that may aid in the diagnosis and management of the patient.

Benign Fatty Abnormalities of the Abdomen

- To differentiate benign fatty changes in the abdomen (greater and lesser omental infarct, epiploic appendagitis, post-surgical/post-traumatic fat necrosis, sclerosing mesenteritis) from worrisome fatty changes such as neoplasm or inflammation/infection.
- To describe pertinent imaging pearls and pitfalls, emphasizing cases where findings are equivocal and follow-up imaging is required.
- To outline how to analyze images and report findings in a way that is easy to understand and comparable.

The áC™Ins and OutsáC™ of 3.0 Tesla MRI Defecography-Making Sure Everything Comes Out OK (Early Experience with High Field Strength Dynamic Pelvis MRI)

- To review normal magnetic resonance imaging (MRI) anatomy of the pelvic floor.
- To illustrate normal MRI findings in pelvic floor dysfunctional conditions.
- To discuss the subtle nuances and techniques needed to optimize MRI Defecography.

Integrated Whole Body PET/MR for Evaluation of Abdominal Malignancies: Their Theoretical Advantages, Clinical Advantages and Pitfalls

- To discuss a variety of pancreatic pathologies which resemble AIP on MRI and demonstrate distinctive MRI findings to differentiate AIP from other pancreatic disorders.
- To review diagnostic criteria for autoimmune pancreatitis with focus on MR imaging findings and histopathological correlation.
- To demonstrate typical and atypical findings as well as pretreatment and post treatment MR imaging features of autoimmune pancreatitis.
- To illustrate MR findings of diverse neoplastic and non neoplastic pancreatic conditions such as pancreatic adenocarcinoma, pancreatic islet cell tumor, lymphoma and metastases which resemble autoimmune pancreatitis on MRI.

Autoimmune pancreatitis poses a common diagnostic dilemma encountered in practice which can be resolved to a great extent by appropriate use of MR imaging. MRI aids in diagnosis of autoimmune pancreatitis and allows the radiologist to determine treatment response. Furthermore MRI acts as an invaluable tool in differentiating several pancreatic entities simulating autoimmune pancreatitis on imaging.
Vascular Bowel Injuries: A Review of Key Findings and Potential Pitfalls

Daniel Lopez Rey, MD
Daniel Fraga Mateiga, MD
Daniel Romeu Vilar, MD
Jorge Rodriguez Antuna, MD
Alba Rois Siso, MD
Maria J Martinez-Sapina Llanas, MD

PURPOSE/AIM
- Review the normal vascular anatomy and territories to the bowel.
- Discuss potential etiologies of arterial and venous bowel injuries, such as arterial embolus, venous thrombus and arterial dissection.
- Describe pertinent imaging features with pearls and potential pitfalls

CONTENT ORGANIZATION
1. Key differential diagnoses and imaging findings
2. Arterial and venous bowel injuries
3. Imaging techniques

SUMMARY
1. Vascular injuries to the bowel are potentially life threatening situations with imaging features that are critical for radiologists to accurately recognize.
2. Arterial and venous bowel injuries have distinct imaging findings such as altered wall enhancement, abnormal wall thickening and specific vascular territories, which help differentiate true vascular insults from potential pitfalls.
3. Additional features such as vascular filling defects, ascites and regional inflammatory changes may also aid in the diagnosis.

Imaging of Esophageal Emergencies

Julia M Howard, MBCh, MRCPI
John Kavanagh, MD
John V Reynolds, MD
Peter Beddy, MD, FRCR

PURPOSE/AIM
Esophageal emergencies are associated with a high morbidity and mortality. Prompt diagnosis and management can significantly improve patient outcome. In this educational exhibit we aim to provide an overview of normal esophageal imaging anatomy, to illustrate the range of imaging findings for each of the esophageal emergencies in turn and to highlight the optimal imaging modalities and techniques to facilitate a fast and accurate diagnosis.

CONTENT ORGANIZATION
- Review the normal vascular anatomy and territories to the bowel.
- Discuss potential etiologies of arterial and venous bowel injuries, such as arterial embolus, venous thrombus and arterial dissection.
- Describe pertinent imaging features with pearls and potential pitfalls

SUMMARY
1. Vascular injuries to the bowel are potentially life threatening situations with imaging features that are critical for radiologists to accurately recognize.
2. Arterial and venous bowel injuries have distinct imaging findings such as altered wall enhancement, abnormal wall thickening and specific vascular territories, which help differentiate true vascular insults from potential pitfalls.
3. Additional features such as vascular filling defects, ascites and regional inflammatory changes may also aid in the diagnosis.

CT-Colonography (CTC) in the Diagnosis of Stenotic Colonic Lesions: Impact of the Findings in Subsequent Therapeutic Management

Maria J Martinez-Sapina Llanas, MD
Alba Rois Siso, MD
Jorge Rodriguez Antuna, MD
Daniel Romeu Vilar, MD
Daniel Fraga Mateiga, MD
Daniel Lopez Rey, MD

PURPOSE/AIM
The aim of this presentation is to review the semiology of different stenotic lesions of the colon (including benign and malignant ones), and to know the algorithms that help us in the further handling such as optical colonoscopy (OC) with sedation performed with gastroscope, surgical treatment, medical therapy or follow-up.

CONTENT ORGANIZATION
The standard technique for studying a suspicious lesion in the colon is OC; however 10-26 % are technically difficult and experienced colonoscopists may not be able to complete the colonoscopy. Strictures, angulation or fixation of colonic loops are known causes of incomplete OC, and in other patients it cannot be performed for being contraindicated. Stenotic lesions of the colon are not uncommon. Although the most serious cause of colonic stenosis is carcinoma, in most cases it is not a neoplastic cause, varying from inflammatory bowel diseases, ischemic colitis, colonic spasm, postsurgical changes, diverticular disease, submucosal colonic lesions or extrinsic...
CTC is an excellent imaging tool to complement the cases of incomplete or contraindicated OC. Furthermore, in most of cases, CTC diagnoses the cause of colonic strictures and allows planning the subsequent therapeutic management.

**Pneumoperitoneum and beyond - A Meticulous Search!**

**LL-GIE2895**

- Palak B Popat, MBBS, MD
- Jayashree R Jadhav, MBBS, DMRD
- Karuna Agawane
- Monika S Bapat, MBBS
- Priya Hira, MBBS, DMRD
- Ulinha S Chakraborty, MBBS
- Yashant Aswani, MBBS

**PURPOSE/AIM**

Air in the abdomen outside its natural habitus in the GI tract could be anywhere, from the abdominal wall to the intestinal wall. The aim is to depict a spectrum of such cases on CT scan, and a message to the radiologist that the tiniest air speck if detected, can alter the patient's management.

**CONTENT ORGANIZATION**

- Source of air
  - a) Hollow viscus perforation – from a pathological bowel or an external injury
  - b) Fistulous communication with a hollow viscus
  - c) Infective
  - d) Environmental air in cases of penetrating injury
  - e) Musculoskeletal air from a fracture or as a degenerative change

- Location of air
  - a) Pneumoperitoneum
  - b) Bowel wall – pneumatosis intestinalis
  - c) Vascular air
  - d) Biliary tree – pneumobilia
  - e) Solid organs – emphysematous pyelonephritis, pancreatitis, cystitis; hepatic and splenic parenchyma

**SUMMARY**

A frank pneumoperitoneum will not be missed by the on-call physician or surgeon who often themselves see the scan in emergency settings. But it is the subtle findings, to be searched for, by the trained eye of a radiologist, which can alter the management strategy such as a need for an urgent exploration.

**CT Gastrography with Dual Source Dural Energy CT: Typical Imaging Findings and Image Interpretation of T Stage Diagnosis of Gastric Cancer with Three-dimensional Imaging and Two-dimensional Iodine Map**

**LL-GIE2896**

- Nobuyuki Shiraga, MD
- Yoshiyuki Okada, MD
- Kenichi Suzuki
- Masahiro Kobayashi, MD
- Tatsuya Gomi, MD
- Ehiichi Kohda, MD

**PURPOSE/AIM**

To propose how you can obtain good data of CT gastrography (patients' position, pretreatment, and dynamic enhancement study) to understand the two and three-dimensional imaging feature of gastric cancers, based on the new classification of UICC 7th edition. To understand the enhancement pattern of gastric cancer, especially early stage cancer, using iodine map reconstructed with the datasets obtained by dual energy scan.

**CONTENT ORGANIZATION**

A: Diagnostic criteria of T-staging of gastric cancer with CT gastrography
B: Pathophysiology of gastric cancer
C: CT imaging (two and three-dimensional)
D: Iodine map (mucosal enhancement)
E: Outcomes (indication for endoscopic dissection)

**SUMMARY**

CT gastrography (CTG) has been reported to be a good diagnostic tool for evaluating T stage of gastric cancer. However, for early stage(T1) cancer, it is still difficult to diagnose T1a and T1b cancer with conventional CTG because of the difficulty of evaluating mucosal enhancement. With the use of iodine map reconstructed with dual energy CT scan datasets, we can diagnose and speculate histopathology of T1a cancer with evaluating mucosal enhancement pattern of the lesion and that leads to confirm the indication for endoscopic mucosal dissection of T1a gastric cancer, as well as demonstrating tumor extent area of advanced gastric cancer two-dimensionally.

**The Small Bowel in CT: Not So Small!**

**LL-GIE2897**

- Alex Grande Astorquiza, MD
- Concha Martinez
- Gonzalo Tardaguila de la Fuente, MD
- Ana Fernandez Del Valle, MD
- Roque Oca, MD

**PURPOSE/AIM**

1. To review in a ludic way some of the entities that can affect the small bowel.
2. To describe their radiologic features in CT.
3. To test yourself against one single CT image.

**CONTENT ORGANIZATION**

A wall containing one single CT image from different entities that can affect the small bowel is presented. Infectious, tumoral, iatrogenic, traumatic, inflammatory, immunologic, congenital, and vascular disorders are included. The attendee can access to each case trough links, and must try to figure out the diagnosis that will be presented in a quiz format. Clinical information and even hints (ex: additional images) to approach the correct diagnosis are offered, if necessary. Key differential diagnostic points will be highlighted in the discussion of each case.

**SUMMARY**

The small bowel is the most extensive organ of the human body where many pathologic entities take place. Last generation CT is an appropriate non invasive diagnostic technique for evaluating not only the wall and intestinal lumen, but also surrounding tissues and organs. Clinical information and interdisciplinary dialogue are essential for a correct diagnostic approach.
Ischemic Cholangitis, When Biliary Tree and Liver Artery Are Not on the Same Road Anymore

Sanaa El Mouhadi, MD
Sarah Derhy
Niklas Colignon
Louisa Aizzi, MD
Yves M Menu, MD
Lionel Arrive, MD

PURPOSE/AIM
-To describe how to explore an ischemic cholangitis on MRI
-To illustrate aetiologies of ischemic cholangitis
-To precise imaging features of ischemic cholangitis
-To detail complications

CONTENT ORGANIZATION
-Etiopathogenic conditions that lead to biliary tree ischemia will be discussed
-Imaging features suggestive of an ischemic cholangitis will be detailed
*Etiology
*Biliary abnormalities and their distribution: two groups can be differentiated: necrotic and stenotic cholangitis
*Complications

SUMMARY
Ischemia-induced bile duct lesions can have several causes such us states of shock, hepatic artery thrombosis or stenosis following transplantation, hepatic intraarterial chemotherapy, radiofrequency, vasculitis, renu osler disease. Two categories can be differentiated: necrotic and stenotic forms. In the stenotic form, proximal and multiple biliary narrowing and stenosis can be observed and in the necrotic form, intrahepatic biliary casts, biliary dilatation and biliary liver abscess are frequent. While biliary abnormalities are easily diagnosed at cholangio MR. Dynamic acquisitions after Gadolinium injection are mandatory to analyse arterial abnormalities and parenchymal complications.

CT Gastrography in Evaluating Gastric Cancer: The Surgeon and the Radiologist Common Point of View

Jin Kyoo Jang, RT
Ah Young Kim, MD
Hyun Jin Kim, MD
Seong Ho Park, MD*
Jong Seok Lee
Hyun Kwon Ha, MD

PURPOSE/AIM
1. To explain the roles of CT gastrography (CTG) for pre- and post-operative evaluation of patients with gastric cancer.
2. To summarize the optimal techniques in tumor staging with the related current evidence.
3. To understand the potential diagnostic pitfalls in cancer evaluation and suggest future works needed.

CONTENT ORGANIZATION
A. CT gastrography in evaluation of suspected gastric cancer
   1. Current technical issues and performance
   2. Feasible imaging tools for tumor staging
B. Preoperative evaluation of the gastric cancer
   1. CTG performance for detecting T1 cancer
   - Distinction of endoscopically resectable vs. unresectable cancers on CTG?
2. T- and M- staging of advanced gastric cancer
   - Current CTG performance
   - Needs for further works C. Diagnostic pitfalls on CTG in evaluating gastric cancer
      1. Technical errors
      2. Missed diagnosis (interpretation errors)
D. Postoperative evaluation with CTG
   1. Various postsurgical CTG findings
   2. Follow up after endoscopic mucosal resection of early gastric cancer

SUMMARY
CTG has multiple substantial roles for gastric cancer patients. Optimizing CT techniques and proper imaging processing can improve tumor detection and staging, which are critical to treatment planning of gastric cancer.

Visual Assessment of MDCT Gastrography with Wall-carving Technique for Gastric Cancer

Yukiko Hara, MD
Tomoyuki Noguchi
Isao Kitano
Masanobu Mizuguchi, MD
Liinxiang Liu
Hiroyuki Irie, MD, PhD
Masashi Nishiara, MD

PURPOSE/AIM
1. To introduce the concept of wall-carving (WC) technique for gastric cancer.
2. To illustrate various CT gastrography appearances of gastric cancers on WC image.
3. To demonstrate usefulness and limitation of CT gastrography of gastric cancers on WC image.

CONTENT ORGANIZATION

SUMMARY
MDCT gastrography by WC image is useful in the diagnosis of gastric cancer using MDCT. Hypervascularity on WC image is observed in both early and advanced gastric cancers, and is useful to detect them. The existence of deformation on WC image is helpful to discriminate possible advanced gastric cancers from obvious early gastric cancers.
LL-GIE2901
Clovis R Coelho, MD
Natally D Rocha, MD
Rodrigo Canellas, MD
Roberto Biasbalg, MD
Ronaldo H Baroni, MD
Manoel S Rocha, MD, PhD

PURPOSE/AIM
To review imaging features related to histiocytic disorders involving abdominal organs, illustrated by clinical cases.

CONTENT ORGANIZATION
Epidemiology of histiocytic disorders.
Classification based on the World Health Organization (WHO) Review illustrated teaching cases (abdominal ultrasound, CT and MRI) emphasizing the imaging features which can help to the specific diagnosis. 
cases of Langerhans cell histiocytosis, sinus histiocytosis with massive lymphadenopathy or Rosai-Dorfman disease, hemophagocytic syndrome and Erdheim-Chester disease, will be shown.

SUMMARY
Histiocytic disorders encompass a group of diseases that have in common the infiltration of monocytes, macrophages and dendritic cells in the affected tissue.
Although nearly a century has passed since the recognition of histiocytic disorders, their pathophysiology remains an enigma. Infectious agents, cellular and immune system dysfunction, neoplastic mechanisms and genetic factors have been implicated in the etiology and pathophysiology of these disorders.
Liver, biliary tract, spleen, kidney, gastrointestinal tract and lymph nodes may be involved in histiocytic disorders. The role of the radiologist is to report the major differential diagnosis and the best possible orientation method for biopsies.

Quantitative and Qualitative Liver Fibrosis Assessment Tools Using Gadoxetic Acid-enhanced MRI in Patients with Diffuse Liver Diseases: The Winner Takes It All

Diana S Feier, MD
Csilla Balassy, MD
Nina Bastati, MD
Friedrich Wrba
Ahmed Ba-Ssalamah, MD

PURPOSE/AIM
1: To learn optimal methods to detect liver fibrosis in chronic liver disease (CLD) patients using a hepatobiliary contrast agent. 2: To systematise and compare several measurement tools tested for liver fibrosis evaluation. 3. To gain an awareness of the MRI appearance of different stages of liver fibrosis

CONTENT ORGANIZATION
1. Imaging pathology changes in different CLD aetiologies: Common and rare conditions – Non-alcohol and alcohol induced steatohepatitis – Viral Hepatitis (B, C) – Autoimmune entities (PSC, Autoimmune hepatitis) – Budd-Chiary Syndrome – Hemochromatosis 2. Quantitative and qualitative liver fibrosis assessment tools: – Liver-to-muscle signal intensity ratio, Liver-to-spleen intensity ration, Relative Enhancement measurements, Contrast enhanced Index, Signal to Noise Ratio, Biliary excretion, enhancement quality and homogeneity quality scores 3. Description of possible histological and biochemical cofounders in imaging interpretation 4. Case examples, in order to show the clinical relevance of gadoxetic acid administration in patients with different CLD

SUMMARY
Demonstrating the close relationship between enhancement, excretion and liver function will enable the radiologist to become more familiar with gadoxetic acid use in diffuse CLD patients and avoid false positive results.

Mucinous Adenocarcinoma of the Rectum-Limitations of Routine High Resolution MR Staging

Harmeet Kaur, MD
Randy D Ernst, MD
Haesun Choi, MD
Sooyoung Shin, MD
George J Chang, MD
Miguel Rodriguez-Bigas, MD
Y. N You, MD

PURPOSE/AIM
Review of staging, imaging findings and tumor-related complications of mucinous rectal carcinoma with high resolution MRI. Limitation of routine T2 weighted images are discussed. We propose a few additional MR sequences to help in defining extent and stage of tumor. Simplified structured reporting format is reviewed.

CONTENT ORGANIZATION
Mucinous adenocarcinoma of the rectum follows a more aggressive course. These tumors more frequently present as hyperintense masses with mucin pools, that may not be adequately assessed on routine high resolution T2 pelvic MR images
We review imaging findings and common complications such as perforation.
Limitations of routine T2 weighted imaging in assessing tumor stage and presence of implants is reviewed
Additional MR sequences such as fat suppressed T2 weighted images, DW images and 3D T2 images that better delineate tumor extent are discussed.
Information required by surgeon for surgical planning is reviewed and a simplified structured report format is presented

SUMMARY
Mucinous adenocarcinoma maybe understaged with routine high resolution T2W images. Additional MR sequences are discussed. Simplified structured report that comprehensively addresses key surgical information is presented.

MR Defecography in the Assessment of Pelvic Floor Disorders: Image with Anatomical, Clinical and Functional Correlation

Jose Gutierrez, MD
Giancarlo Schiappacasse, MD
Felipe Gonzalez, MD

PURPOSE/AIM
1. To review the essential technical aspects of the MR defecography
2. To provide anatomical and physiological essential knowledge to understand the pathological conditions of the pelvic floor and its correlation on MRI
3. To show the signs of pelvic floor diseases on MR-defecography, and give tips to the report
Introduction

MRI technique

Pelvic floor anatomy and physiology

Pathological conditions

• Anterior compartment abnormalities
• Middle compartment abnormalities
• Posterior compartment abnormalities

A clinical and functional view

• Urinary incontinence
• Anal incontinence
• Constipation
• Genital prolapse

Tips to report writing

Conclusions

SUMMARY

1. Pelvic floor disorders affecting almost exclusively women and primarily manifested by constipation, genital prolapse, fecal incontinence and urinary incontinence, which cause significant impairment of quality of life

2. MR-defecography allows to analyze the dynamic behavior of pelvic floor, providing critical information for surgical planning, with clear advantages over conventional cysto-colpo-defecography

3. The anatomical approach alone is not enough. The functional perspective, and clinical correlate are basics for the final diagnostic

Surgical Approaches to Mesenteric-Systemic Shunts: Role of the Radiologist

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Abdulrhman Elnaggar, MD
Shohreh Rezai, MD
Jean Emond

PURPOSE/AIM

Surgically created shunts between the mesenteric and systemic circulations can play a vital role in the management of patients with portal hypertension secondary portal vein thrombosis. The Radiologist, as part of the Liver Team, plays a vital role in identifying portal vein thrombosis and assessing the patient’s response to the shunt after surgery. This exhibit will review preoperative imaging protocols, the surgical shunt procedures, and post operative imaging, including an emphasis on 3D post processing.

CONTENT ORGANIZATION

1. MRI protocols for identifying portal vein thrombosis, including the use of Ablavar and case examples 2. Surgical shunts, including the Rex Shunt, Selective Splenorenal Shunt, and Non-Selective Mesocaval Shunt. 3. 3D MRI post processing to evaluate the regeneration patterns post shunt creation. 4. Review of clinical outcomes from published literature and experience at our center.

SUMMARY

This exhibit will review the vital role of the Radiologist in the identification of portal vein thrombosis and post surgical assessment of liver regeneration. After viewing this exhibit, the Radiologist will understand MR imaging of portal vein thrombosis, the surgical shunts used to treat this condition, and the pattern of regeneration depicted by 3D post processing.

Imitators of Hepatic Metastasis during Chemotherapy: What Do We Currently Know?

Sung-Hye You
Beom Jin Park, MD
Na Yeon Han
Min Ju Kim, MD
Deuk Jae Sung, MD
Sung Bum Cho

PURPOSE/AIM

The purposes of this exhibit are: 1. To review the spectrum of non-neoplastic and neoplastic disease that can imitate hepatic metastasis during chemotherapy in cancer patient. 2. To provide pathophysiologic basis of chemotherapy-related and –unrelated imitator of metastasis. 3. To highlight the important clue and pitfalls resulting in an accurate diagnosis of various mimickers from true metastasis.

CONTENT ORGANIZATION

1. The concept of imitator of hepatic metastasis during chemotherapy: Indeterminate lesion, pseudometastasis, incidentaloma etc. 2. Chemotherapy-related: sinusoidal obstruction syndrome, steatohepatitis, chemotherapy-induced focal hepatopathy including peliosis, focal steatosis, hepatic adenoma, FNH; Chemotherapy-unrelated: (1) Inflammatory: tumor associated eosinophilic abscess, candidiasis, parasitic infection (2) Tumor: peribiliary gland hamartoma (3) Idiopathic: pseudolipoma 3. Differential diagnosis between “Imitators” and true metastasis of liver

SUMMARY

A group of unfamiliar “newly emerging” hepatic lesion in cancer patient exists, which may mimic hepatic metastasis but may demonstrate characteristic clinical, epidemiological, and imaging features that permit precise differentiation. Knowledge of these entities and their clinical and imaging feature would be help to avoid unnecessary exposure to another salvage regimen or invasive treatment.

The Clock That Turned Wrong-Small Bowel Volvulus in Malrotation and Normal Rotation

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Karuna Agawane
Monika S Bapat, MBBS
Palak B Popat, MBBS, MD
Priya V Badhe, MD
Priya Hira, MBBS, DMRD

PURPOSE/AIM

To review the CT findings in small bowel volvulus along with a brief discussion of its etiology; congenital as well as acquired.

CONTENT ORGANIZATION

1) A few relevant definitions like volvulus, malrotation, obstruction, incarceration and strangulation
2) Relevant embryology, anatomy and pathogenesis
3) Imaging findings of small bowel volvulus on CT, Plain radiographs, Barium studies and Ultrasound with emphasis on CT-findings of volvulus in malrotated gut as well as in those with normal rotation of gut.

SUMMARY

A sound knowledge of the normal anatomy of the peritoneal cavity is a must before embarking on diagnosis of small bowel volvulus or any such pathology.
With an increase in the overall incidence of small bowel obstruction, it has become mandatory to know the various etiologies and the characteristic imaging findings, particularly on CT, which has become a mainstay in the work up of small bowel obstruction and planning surgical management thereby reducing significant morbidity and mortality.

**Inflammatory Diseases of Gallbladder: Review and Re-evaluation of MDCT and Other Imaging Modalities Correlation with Pathology**

**LL-GIE2908**
Keum Nahn Jee, MD, PhD
Jeong Rye Kim, MD
You Jin Kim
Mi-Hyun Park, MD

**PURPOSE/AIM**
1. To review the various inflammatory conditions of gallbladder (GB) and typical CT findings of each of them.
2. To correlate various imaging findings of CT, US, MRCP, ERCP and hepatobiliary scintigraphy in each inflammatory condition of GB with clinical and pathologic findings.
3. To discuss the differential points of acute complicated cholecystitis needed emergent operation and chronic and secondary cholecystitis needed elective surgery after careful evaluation.

**CONTENT ORGANIZATION**
Demonstration of various imaging findings of diverse inflammatory conditions of GB using different imaging modalities and correlation of imaging findings with clinical and pathological findings.

**SUMMARY**
Diverse acute and chronic inflammatory conditions can affect GB and various kinds of radiological imaging modalities play important roles for appropriate evaluation of patients with suspicious or complicated inflammatory disease GB. Thin section MDCT findings could provide diverse, detailed, and constitutive imaging findings for differentiation of various inflammatory conditions of GB. And other image findings, such as sonographic Murphy's sign in acute cholecystitis and markedly decreased ejection fraction of biliary scintigraphy in chronic cholecystitis, may be also important role in accurate diagnosis.

**MR-Defecography: How to Perform, How to Interpret**

**LL-GIE2909**
Ansgar Malich, MD
Joachim Feger, MD
A Voigtberger

**PURPOSE/AIM**
MR-based defecography is an increasingly important method not only for gynecologists but also surgeons preoperatively. Aim of this presentation is to explain how to perform and prepare the examination, how to interpret typical findings and how to create a reliable diagnostic summary of the findings.

**CONTENT ORGANIZATION**
Indications and contraindications for MR-defecography are stated. Paper summarizes the essential clinical information being necessary to know for an optimally planned and performed examination. Additionally paper focusses on how to do an examination and on all the needs for this special MR application. Then typical configurations, anatomical landmarks, lines and physiological findings are shown (incl movies during the defecography). Pathological findings are shown at several examples, which are detailed explained. Finally a small quiz allows the reader to verify the obtained knowledge.

**SUMMARY**
MR defecography is a useful and new method. When performed and interpreted correctly, this dynamic examination offer the detailed diagnosis of dysfunction during the defecography not otherwise obtainable and of relevance for several clinicians, not only gynecologists. This paper aims to improve the availability of this method by a detailed explanation of how to indicate, prepare, do and interprete an MR-defecography.

**Petersenâ€™s Hernia Post Roux-en-Y Gastric Bypass: Imaging Findings and Clinical Implication**

**LL-GIE2910**
Aki Takahashi, MD
Nagaaki Marugami
Junko Takahama, MD
Takahiro Itoh, MD
Kimihiko Kichikawa, MD

**PURPOSE/AIM**
1. To recognize the operative procedure of Roux-en-Y gastric bypass (RYGB) and Petersen's space leading to internal hernia. 2. To understand imaging findings of Petersen's hernia on MDCT.

**CONTENT ORGANIZATION**
1. Review the operative procedure and anatomical changes after RYGB. 2. Recognize the Petersen's space after RYGB with illustrations. 3. Discuss the clinical symptom and diagnostic difficulties. 4. Describe and illustrate the imaging findings of Petersen's hernia with emphasis on; bowel, mesenteric and vascular abnormalities.

**SUMMARY**
CT Colonography Bowel Preparation: Which One?

**LL-GIE2911**
Fabrizio Vecchietti, MD
Marco Rengo, MD
Damiano Caruso, MD
Davide Bellini, MD
Marco Maria Maceroni, MD
Andrea Laghi, MD *

**PURPOSE/AIM**
to compare and propose several bowel preparation in patients who undergoing at CT colonography examination.

**CONTENT ORGANIZATION**
CTC is a flexible technique for the detection of polyloid lesions and cancer of the colon. Intestinal cleansing is a primary step in order to remove as much as possible fluid and fecal residual which are due to errors of interpretation and can generate several diagnostic problems. Only a clean colon can allow a precise identification and characterization of even small lesions. o show several approaches and effects of major intestinal preparations (cathartic and non cathartic prep) and the role of oral and intravenous contrast medium administration in patients who have undergone CT Colonography examinations.

**SUMMARY**
Spatial Distribution of Cancers on CT Colonography Using Geographical Information Systems (GIS)

LL-GIE2912  
Faeezeh Sodagari, MD  
Pedram Golnari, MD  
Hamid R Baradaran, MD, PhD

PURPOSE/AIM  
Geographic Information Systems (GIS) can be used in a variety of applications to integrate data and explore the spatial relationship of geographic attributes, e.g., Computed tomography (CT) colonography (virtual colonoscopy). Surgical and pathological reports can be integrated into this method in order to determine the most common locations at risk of false negative or false positive readings in virtual colonoscopy. Using a spatial regression model, the anatomic location of the lesions can be correlated with the clinical data including age, gender, response to chemotherapy or radiation, and overall survival.

CONTENT ORGANIZATION  
- Brief introduction to the geographical information systems applications and limitations  
- Current available software and analyses  
- Role of GIS approach in anatomic findings  
- Demonstrating the integration of a GIS analysis with the pathologic findings in virtual colonoscopy  
- Determining the most vulnerable locations for false interpretations by the radiologists  
- Assessing the correlation of the pathology location with clinical data and patients survival

SUMMARY  
Use of GIS can improve our knowledge regarding the association of pathology location with clinical outcomes and prognosis. It can help radiologist understand the most common locations with the higher risk of false positive and negative interpretations.

High Resolution MR Imaging of Rectal Carcinoma at 3Tesla - Classification, Technique, Imaging Features, Staging and Management - A Review

LL-GIE2913  
Karthik Ganesan, MBBS, MD

PURPOSE/AIM  
Colorectal carcinoma is the commonest malignancy of the gastrointestinal tract, and rectal carcinoma constitutes approximately 25% of all colorectal neoplasms. This exhibit reviews the spectrum of imaging patterns of rectal carcinoma and the impact of high resolution multiplanar MR imaging at 3T on the accurate pre operative staging and management.

CONTENT ORGANIZATION  
This exhibit is divided into the following sections A. Introduction B. MR Protocol and technique C. Review the staging classification D. Impact of MR imaging findings on the management E. Potential pitfalls

SUMMARY  
High-resolution MR imaging of the rectum at the 3T plays a vital role in the pretreatment staging of rectal carcinoma and the appropriate selection of treatment options. Radiologists should understand the technique and key imaging features of rectal carcinoma which would help formulate accurate diagnosis, play a vital role in pre-operative staging and acts as a guide to patient management.

3D TVS Fistulography with Hydrogen Peroxide (H2O2) for Perianal Fistula Evaluation: Way to Go!

LL-GIE2914  
Ruju V Doshi, MD  
Balaji M Reddy, MD

PURPOSE/AIM  
Purpose of this exhibit is To introduce 3D TVS fistulography with Hydrogen Peroxide as a technique in peri anal fistula evaluation. To show virtue and limitations of the technique. To demonstrate our preliminary work as pictorial essay.

CONTENT ORGANIZATION  
Detailed explanation of the technique for 3D TVS with and without hydrogen peroxide administration. Detailed explanation of 3D data post processing in rendered and tomographic modes. Demonstration of various peri anal fistula and abscesses with their classification. Discuss advantages and limitations of the technique.

SUMMARY  
3D TVS fistulogram with Hydrogen Peroxide is a promising technique for evaluation of peri anal fistula according to our work and experience of last 3 years. Though MRI is and will remain gold standard, 3D TVS fistulogram serves as handy, low cost imaging technique with out any radiation hazard and any need of special equipment. Especially 3D demonstration of tracts with H2O2 and tomographic post processing of 3D data improves diagnostic accuracy.

Not Another One.İı¼½ Making Sense of CT and MR Imaging Features of Focal Splenic Masses

LL-GIE2915  
Sara E Smolinski, MD  
Qiqing Ge, MD  
Dmitry Rakita, MD  
Shirley M McCarthy, MD, PhD

PURPOSE/AIM  
The purpose of this exhibit is to provide a clinical context for the radiologist encountering splenic masses on imaging and offer an overview of the role of CT and MR in characterization of a wide spectrum of focal splenic abnormalities.

CONTENT ORGANIZATION  
1. Review the normal splenic anatomy, function and imaging features of the spleen. 2. Discuss the incidence, pathophysiology and clinical significance of focal splenic masses. 3. Discuss the role of CT and MR in evaluation of the spleen and review CT and MR imaging findings of focal splenic masses. Various splenic pathologies will be reviewed, including benign and malignant tumors, inflammatory, and infectious etiologies. Typical as well as unusual manifestations of common and rare entities will be demonstrated.

SUMMARY  
Indeterminate focal splenic masses are frequently incidentally detected on routine imaging studies. CT and MR imaging features of focal splenic masses will be reviewed. At the end of this presentation, the viewer will become familiar with the incidence, clinical implications and imaging features of common and unusual manifestations of a wide spectrum of focal splenic pathologies.

Cystic Lesions of the Liver - Good, Bad and the Ugly: Review of MR Imaging Features at 3 Tesla

Back to Top
LL-GIE2916
Karthik Ganesan , MBBS, MD

PURPOSE/AIM
A broad spectrum of pathologies, both benign and malignant may present as focal or multifocal cystic lesions, or as a cyst with a solid component. This exhibit reviews the spectrum of cystic lesions of the liver and discusses the impact of high resolution multiplanar MR imaging at 3T on the early detection, accurate diagnosis and the management of these lesions.

CONTENT ORGANIZATION
This exhibit is divided into the following sections A. Introduction B. MR imaging protocol C. Discuss the various pathologies with key imaging features D. Potential pitfalls

SUMMARY
High resolution MR imaging at 3T plays a pivotal role in the accurate assessment of focal or multifocal cystic lesions. Radiologists should understand the key MR imaging features of cystic liver lesions which would help to formulate accurate diagnosis, play a pivotal role in pre-operative staging and act as a guide to precise patient management.

The Not So Common Abdominal Calcifications-A Key to Diagnosis

PURPOSE/AIM
To exhibit a variety of abdominal calcifications with an attempt to reach the underlying etiology for the patient’s discomfort with the help of these calcifications.

CONTENT ORGANIZATION
Urinary and biliary calculi are the most common encountered calcifications in the abdomen which usually are a reflection of some metabolic derangement. However, there are a host of other calcific foci which may be pointers to a specific entity. These may be classified as:

According to location
1. Intraperitoneal A. solid viscera involvement
   B. mesenteric
   C. luminal
   D. pelvic
   E. vascular
2. Extraperitoneal A. muscles
   B. ligaments

According to etiology:
A. developmental: dermoid (ileal, mesenteric, ovarian, intraperitoneal)
B. acquired: traumatic-myositis ossificans
C. inflammatory: calcified granulomas, diverticular calcification
D. metabolic: muscles and ligaments in hyperparathyroidism
E. metastatic: Calcified metastasis from hepatoblastoma

Representative cases-

SUMMARY
TEACHING POINTS OF THIS EDUCATIONAL EXHIBIT ARE:
1. Large number of calcifications are seen on CT imaging, which are often missed on plain radiographs.
2. Calcific foci seen in the abdomen can impart clues to the radiologist with its presence reflecting an ongoing pathology.

Use of Parallel Imaging in Body MRI on 1.5T and 3T: Challenges and Ways to Improve

PURPOSE/AIM
Parallel imaging uses multiple elements of a phased array coil. Each element in the coil is related to a dedicated radiofrequency channel whose signals can be processed together. Spatial data yielded by array of different coil elements can be used for partial phase encoding for shorter acquisition time. Several reconstruction algorithms can be used to accomplish this. There are two basic times of these algorithms: one type reconstruct data before Fourier transformation and other type do it after Fourier transformation. Both these algorithms require calibration data for each coil element. There are several advantages of using parallel imaging mainly reduced scan time at the same time it has some drawbacks and some unique artifacts. In this exhibit, we present simplified physics behind parallel imaging and challenges that come with it and trouble shooting guide. Some artifacts are unique to 3T MRI.

CONTENT ORGANIZATION
1. Physics of parallel imaging
2. Advantages of parallel imaging
3. Artifacts seen with parallel imaging on 1.5T and 3T MRI and how to resolve them

SUMMARY
An update on parallel imaging in body MRI is provided with ways to improve the image quality.

"Low-Tech" Barium Imaging to "High-Tech" Virtual CT Imaging: Understanding the Relevance of Imaging Tools for Gastric Imaging from a Gastroenterologist’s Perspective

PURPOSE/AIM
1. To illustrate the imaging findings of various gastric lesions on standard Double contrast barium meal (DCBM) and Multidetector computed...
2. To assess whether conventional imaging (Double contrast barium meal) still holds its ground in the modern era of virtual imaging.

**CONTENT ORGANIZATION**

1. Various pathologies (Inflammatory, Neoplastic, Infective, Corrosive injury and Trichobezoar) involving stomach and their appearance on DCBM and MDCT including virtual gastroscopy.
2. Detection of various gastric lesions on DCBM and MDCT with comparison of sensitivity and specificity for diagnosing various pathologies as compared to gold standard (endoscopy followed by histopathology).

**SUMMARY**

1. MDCT and DCBM are excellent imaging modalities for the diagnosis of gastric pathologies.
2. MDCT is superior to DCBM for overall gastric pathology detection, however DCBM is better than MDCT with virtual gastroscopy for small lesions limited to gastric mucosa only.
3. DCBM may be considered as the first line investigation for diagnosing gastric lesions.
4. Tedious procedure, lack of expertise amongst newer radiologists, and limited evaluation of extra-luminal extent of disease may be the reasons responsible for decline in double contrast barium meal in today’s era rather than it's poor sensitivity.

**MDCT and MRI of the Ampulla of Vater: Technique Optimization, Normal Anatomy, Ampullary Disorders, and Pitfalls**

**LL-GIE2920**

**Aleksandar Ivanovic**

**Dejana Radulovic**, MD

**Daniel A Souza**, MD

**Koenraad J Mortele**, MD

**PURPOSE/AIM**

To describe the normal and abnormal MDCT and MRI appearances of the ampulla of Vater and to provide technical pearls on how to maximize its visualization using both techniques.

**CONTENT ORGANIZATION**

1. Overview of dedicated MDCT and MRI technique to image the ampulla;
2. Review of normal ampullary anatomy and anatomical variants;
3. Illustrative cases of ampullary neoplasms (benign and malignant epithelial and mesenchymal tumors), ampullary stenosis, ampullitis, and gaping ampulla;
4. Examples of common pitfalls encountered when evaluating the ampulla, such as an impacted CBD stone, juxta papillary duodenal diverticulum, ectopic pancreas, and Brunner gland hyperplasia

**SUMMARY**

Dedicated MDCT and MRI techniques and familiarity with the normal anatomy, spectrum of disorders, and possible pitfalls involving the ampulla of Vater play a major role in the improved diagnosis of ampullary abnormalities.

**‘Oh No, It’s SBO!’: An On-call Guide to Small Bowel Obstructions for Residents**

**LL-GIE4635**

**Stephanie Channual**, MD

**Anokh Pahwa**, MD

**Cecilia M Jude**, MD

**Maitraya K Patel**, MD

**PURPOSE/AIM**

1. Describe the imaging signs that indicate small bowel obstruction.
2. Provide tips to locate transition points.
3. Discuss when to emergently recommend surgical evaluation.
4. Discuss the different etiologies for small bowel obstruction as well as relevant differential diagnoses.

**CONTENT ORGANIZATION**

1. Imaging criteria for the diagnosis of small bowel obstruction will be reviewed. A comprehensive review on how to locate transition points will be provided. A pictorial review of the different causes for small bowel obstruction will be presented, which include intraluminal abnormalities (bezoar and gallstones), intrinsic lesions and strictures (Crohn’s disease, intussusception, and radiation), and extrinsic lesions (adhesions, hernias, and metastases). Findings which can indicate ischemic bowel and images of closed loop obstruction and strangulated obstruction will also be included. Differential diagnoses of small bowel obstruction, including scleroderma, ileus, and colonic obstruction will also be discussed.

**SUMMARY**

When a patient presents with clinical features of obstruction, accurate radiological assessment is essential in determining the level of obstruction, and potentially the cause and severity of obstruction. Active collaboration between radiologists and surgeons is necessary to optimize the diagnostic evaluation and management.

**Gastrointestinal (CT Dose Reduction I)**

**Sunday, 10:45 AM - 12:15 PM • E353A**

**SSA06 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5**

**Moderator**

**Joel G Fletcher**, MD *

**Anno Graser**, MD *

**PUPPOSE**

Recent data from lifespan study from Japanese Atomic Explosion estimate increased Excess Lifetime Risks (ELR) of certain radiation-induced solid cancers, when exposure occurs at middle age rather than in childhood. The purpose of our study was to assess population based estimated ELR for solid cancers following abdominal CT in different age groups using size adjusted CT protocols in a large tertiary health care center.

**METHOD AND MATERIALS**

Our IRB approved study included 2902 consecutive routine abdominal CT. Dose monitoring software (Exposure, Radimetrics) was used to obtain patient demographics, scanning parameters as well as radiation dose information (Size Specific Dose Estimate (SSDE) estimated effective doses (EED) and organ doses). Patients were stratified by age groups of 11-20, 21-30, so on, >70 years. Estimated ELR from the time of exposure from chest CT was estimated based on recently reported literature on risk estimation from radiation
RESULTS
SSDE for routine abdominal CT examinations were highest for age group 61-70 years (11 mGy) and lowest for 10-20 years (9.4 mGy). EED (ICRP 103) were 6.9-8.7 mSv and 11.4-9.1 mSv for these age groups (p < 0.05).

CONCLUSION
SSDE and estimated effective doses are suboptimal for cancer risk estimation and organ doses should be used for solid cancer radiation induced risk estimation, regardless of patient’s age.

CLINICAL RELEVANCE/APPLICATION
Contrary to the prior belief, dose concerns are not only important for the younger age groups (0-20) but also for older patients (30-60 years), especially for risk estimations of lung, breast cancers.

SSA06-02 • Multi-reader Detectability of Simulated Low-contrast, Low-attenuation (LCLA) Liver Lesions on MDCT: Effect of Dose and Reconstruction Method

Ajit H Goenka MD (Presenter); Brian R Herts MD *; Nancy A Obuchowski PhD; Andrew Primak PhD *; Frank Dong PhD *; Wadih Karim RT; Mark E Baker MD *

PURPOSE
To assess the effect of reduced radiation exposure and reconstruction method on detection of lesions that are low-contrast, low-attenuation (LCLA) relative to the background liver

METHOD AND MATERIALS
Semi-anthropomorphic phantom containing custom inserts with 36 spherical liver lesions of 3 sizes and attenuations (10 and 15-mm at 6, 12 and 18HU, and 5-mm at 12, 18 and 24HU below 90HU simulated liver) was scanned at 120kVp, 0.6-mm collimation, 200 (CTDIvol 13.49), 150, 100 and 50mAs on a 128-slice MDCT scanner (Definition Flash, Siemens). Lesions were distributed non-uniformly to reduce memory bias. Images were reconstructed to 3-mm thickness using filtered back projection (FBP) and sinogram-confirmed iterative reconstruction (SAFIRE, S3). A randomized dataset containing 256-images was generated for each reader (12 images with one lesion, 12 with two lesions and 8 without lesions, for each dose and reconstruction method). Eighteen Radiologists blinded to phantom and study design independently reported region-level presence or absence on a 5-point diagnostic confidence scale. Statistical evaluation included multi-reader, multi-case (MRMC) ROC analysis using nonparametric methods with the area under the ROC curve (AUC) considered accuracy.

RESULTS
Pooled AUC decreased with each 25% reduction from 100% dose: 0.848, 0.842, 0.792 and 0.743 for SAFIRE. At a given dose, improvement in AUC with SAFIRE was, however, not statistically significant. For both FBP and SAFIRE, accuracy at 75% dose was statistically equivalent to 100% dose FBP (p = 0.002 and 0.23, respectively). In this LCLA liver lesion model, a 25% dose reduction did not reduce detection of the lesions studied. However, detection was inferior with each subsequent dose reduction regardless of reconstruction method. For lesions with attenuation differences larger than or equal to 12HU, lesion detection was not reduced even at 50% dose with FBP.

CLINICAL RELEVANCE/APPLICATION
Estimates of loss of accuracy at reduced doses and limits of iterative reconstruction should be known especially for low contrast, low attenuation liver lesions to enable dose optimization in practice.

SSA06-03 • Effect of the Learning Curve on Radiologist’s Diagnostic Performance for Hypervascular Liver Lesion Detection and Image Quality Perception Using an Adaptive Statistical Iterative Reconstruction Algorithm

Daniele Marin MD (Presenter); Achille Mileto MD; Lisa M Ho MD; Brian C Allen MD; Rajan T Gupta MD *; Ehsan Samei PhD *

Rendon C Nelson MD *

PURPOSE
To prospectively evaluate the effect of an adaptive statistical iterative reconstruction (ASIR) algorithm on diagnostic accuracy and confidence for the diagnosis of hypervascular liver tumors, as well as reader’s perception of image quality, using dual energy CT (DECT).

METHOD AND MATERIALS
Patient consent was obtained for this IRB-approved, HIPAA-compliant, prospective study. The final study cohort comprised 40 patients (29 M; mean age, 60±8.4 years; mean BMI, 28±5.6 kg/m2) with 65 hypervascular liver lesions who underwent DECT during the hepatic arterial phase. The low energy (80 kVp) image set was reconstructed with standard filtered backprojection (FBP) and ASIR at 20%, 40%, 60%, and 80% levels of blending. Two readers (one attending and one fellow in abdominal imaging) inexperienced with the imaging appearance of ASIR reconstructions randomly assessed all image sets for confidence in detecting and characterizing liver lesions, as well as evaluation of image quality (1st session). The same cases were re-examined by the same readers after three years of readers’ experience with ASIR in their daily practice (2nd session).

RESULTS
For both reading session, there was no significant difference in diagnostic accuracy and sensitivity for lesion detection using different reconstruction algorithms, among different readers. Diagnostic accuracy did not change significantly between the 1st and 2nd session for both FBP (0.91 vs. 0.90) and any levels of ASIR reconstruction (0.90 vs 0.92). However, while ASIR yielded a significant decrease in specificity for lesion detection compared to FBP during the 1st session (0.81 vs. 0.62, P = 0.001), no significant difference in specificity was observed between ASIR and FBP in the 2nd session. Readers’ perception of image quality improved significantly for any levels of ASIR reconstruction between the 1st and 2nd session (P < 0.05).

CONCLUSION
Reader’s experience with ASIR does not significantly change diagnostic accuracy for hypervascular liver lesion detection, but may decrease the number of false positive findings as well as improve reader’s perception of image quality.

CLINICAL RELEVANCE/APPLICATION
Reader’s experience with ASIR improves subjective perception of image quality and may significantly decrease false-positive findings.

SSA06-04 • Potential of Radiation Dose Savings in Abdominal and Chest CT Using Automated Tube Voltage Selection in Combination with Automated Tube Current Modulation

Mathias Meyer (Presenter); Caroline Mayer; Christian Fink MD; Bernhard Schmidt PhD *; Martin U Sedlmair MS *; Paul Apfaltrer MD; Thomas G Flohr PhD *; Stefan O Schoenberg MD, PhD *; Thomas Henzler MD

PURPOSE
To evaluate the simultaneous use of automatic tube current modulation (ATCM) and automatic tube voltage selection (ATVS) for abdominal and thorax contrast-enhanced CT examinations regarding radiation dose reduction and image quality.

METHOD AND MATERIALS
In total 617 consecutive patients were enrolled in this retrospective single center study who all either underwent a portal-venous abdomen CT examination or a contrast-enhanced arterial phase chest CT examination and were divided into two groups. In group A, 317 patients were enrolled using ATCM with a fixed body-mass-index adjusted tube voltage of either 120 kV or 100 kV. In group B, consisting of 300 patients, ATCM as well as ATVS was used. Image attenuation and noise was measured in different abdominal and thoracic regions for each patient. To compare the CT density and image noise, signal-to-noise ratio, contrast-to-noise ratio and radiation parameters...
between both groups a 1-way analysis-of-variance was preformed.

RESULTS
The mean contrast-to-noise ratio and the signal-to-noise ratio of abdomen and chest CT scans was higher in group B if compared to group A (p = 0.05).

CONCLUSION
The simultaneous use of ATVS and ATCM allows for significant radiation dose reduction in abdominal and thoracic contrast enhanced CT examinations when compared to the use of ATCM alone while maintaining adequate image quality and diagnostic confidence without user interaction. The ATVS tool reduced tube voltage effective in the majority of patients (49%) resulting in a dose reduction of 18%, demonstrating the potential of this new dose modulation tool.

CLINICAL RELEVANCE/APPLICATION
Simultaneous use of ATCM and automatic tube voltage selection allows for significant radiation dose reduction in abdominal/thoracic CT examinations of up to 18% when compared to ATCM alone.

SSA06-05 • Model Based Iterative Reconstruction Algorithm for Abdominal CT at Variable Radiation Doses: Assessment of Image Quality, Lesion Conspicuity and Radiation Dose in Anthromorphic Liver Phantoms

Jeong Hee Yoon MD (Presenter) ; Jeong-Min Lee MD * ; Mi Hye Yu MD ; Joon Koo Han MD ; Byung Ihn Choi MD, PhD *

PURPOSE
To assess the image quality, lesion conspicuity and radiation dose of model-based iterative reconstruction algorithm (IMR) compared with filtered back projection (FBP) and hybrid iterative reconstruction algorithm (IDose) for the liver computed tomography (CT) at radiation dose.

METHOD AND MATERIALS
Small and large anthropomorphic phantoms with 4 simulated hypervascular tumors and 4 hypovascular tumors were scanned using a 256-channel CT scanner using 120 and 100kVp with 20, 40, 60, 80, 100, 130, 150, 180 and 200mAs. CT images of both phantoms at the two kVp were classified by radiation dose: standard dose (200mAs); mild dose reduction (DR) (130-180mAs), moderate DR (60-100mAs), severe DR groups (20-40mAs). All scans were reconstructed using FBP, IDose level 4 and IMR. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated in the organs and compared among the different reconstruction modes. In addition, two radiologists assessed the image quality and lesion conspicuity of 8 focal liver lesions (FLs).

RESULTS
SNR and CNR of IMR images were significantly higher than those of others, at the same radiation dose in both phantoms by reducing noise effectively (p < 0.05).

CONCLUSION
IMR significantly reduces noises and improved SNR and CNR compared with FBP and IDose, and provide the similar image quality with mild to moderate dose reduction in variable body habitus. However, IMR can improve FLL conspicuity only with mild to moderate dose reduction.

CLINICAL RELEVANCE/APPLICATION
IMR can reduce noise and improve image quality and allows use of lower radiation dose for abdominal CT. Lesion conspicuity can be improved with IMR at mild to moderate dose reduction, severe dose redu

SSA06-06 • Assessment of Hybrid and Pure Iterative Reconstruction with Filtered Back Projection Technique for Low Dose Abdominal CT

Atul Padole MD (Presenter) ; Sarabjeet Singh MD ; Michael A Blake MBCh * ; Garry Choy MD, MS ; Sanjay Saini MD ; Mannudeep K Kalra MD * ; Synho Do PhD * ; Ranish D Khawaja MBBS ; Sarvenaz Pourjabbar MD ; Diego A Lira MD

PURPOSE
To evaluate standard and low dose abdominal CT images reconstructed with filtered back projection (FBP), hybrid (hIRT) and pure (pIRT) iterative reconstruction techniques.

METHOD AND MATERIALS
In an IRB approved, prospective clinical study, 20 patients (mean age 59 ± 14 years, mean weight 181±41 lbs, M:F 13:7, undergoing routine abdomen CT on a 64 channel MDCT (Discovery CT750 HD) gave written informed consent for acquisition of an additional scan. Three board certified abdominal radiologists performed independent and blinded comparison for lesion detection, lesion margin, visibility of small structures and diagnostic acceptability. Objective measurements, noise spectral density was obtained.

RESULTS
Mean CTDIvol were 9.3±3.5 and 1.3±0.2 mGy for standard and submSv CT, respectively. Lesion conspicuity was improved from poorly visualized margins in FBP and hIRT images to well defined margins on submSv pIRT. All 3 radiologists found suboptimal noise in submSv FBP and pIRT images, whereas noise was acceptable with pIRT. Except for minor pixilated appearance of pIRT images, no significant artifacts were seen. Noise power spectrum analyses showed hIRT retains the noise spectral signature as FBP, in spite of lowering the noise, whereas pIRT had lower noise as well as more regularized noise spectral pattern.

CONCLUSION
SubmSv abdominal CT examinations when reconstructed with pIRT improves the visualization of lesion margins and normal abdominal structures and are associated with lower image noise as compared to hIRT and FBP, without any significant image artifacts affecting diagnostic interpretation.

CLINICAL RELEVANCE/APPLICATION
Pure iterative reconstruction technique can allow use of submSv radiation dose for routine abdominal CT with retained diagnostic confidence.

SSA06-07 • Comparison of Dose from Single Energy and Dual Energy Multi-detector Computed Tomography Examinations in the Same Patient Screened for Hepatocellular Carcinoma

Andrei S Purysko MD (Presenter) ; Mark E Baker MD * ; Andrew Primak PhD * ; Erick M Remer MD ; Nancy A Obuchowski PhD ; Binu John MD, MPH ; Federico Aucejo ; Brian R Herts MD *

PURPOSE
To compare the dose and noise level between single energy (SE) and dual energy (DE) multi-detector computed tomography (MDCT) examinations in patients undergoing screening for Hepatocellular Carcinoma (HCC).

METHOD AND MATERIALS
IRB-approved, HIPPA-compliant prospective study of 59 adult subjects (mean age 59.5yrs) undergoing HCC screening with 3-phase CT (unenhanced, arterial and portal-venous phases), who were each examined on both SE (Sensation 64, Siemens Healthcare) and DE CT scanners (Flash, Siemens Healthcare) on different dates. SE scans were performed using 120kVp and weight-based mAs (mAs=patient's weight), and DE scans at 100kVp and 140kVp, with mAs adjusted to match the estimated CTDIvol of a weight-based mAs SE scan. The CTDIvol and DLP of each phase were recorded. Maximum anteroposterior and transverse dimensions measured from CT radiographs were
used to calculate the effective diameter (ED) and size-specific dose estimate (SSDE). Regions of interest (ROI) were drawn in liver, retroperitoneal (RP) fat, IVC, and aorta and Hounsfield unit values with Standard Deviation (SD) recorded. Paired t-tests were used to compare BMI, weight, and ED at the time of the two imaging studies. Distributions of outcome variables (dose and noise) were examined using Q-Q plots and Shapiro tests.

RESULTS
BMI and weight of the subjects were highly correlated with the ED (r=0.75 and 0.87) and did not differ significantly between the two scans. CTDIvol and SSDE were significantly lower for all the phases on DE scans compared to SE scans (p-values are significant). Dose with the MDCT DE scanning protocol was significantly lower when compared to SE examinations, with either similar or lower noise levels.

CONCLUSION
Dose scanning protocols can be an alternative to decrease dose in patients undergoing HCC screening who require repetitive imaging.

SSA06-08 • Ultra Low-Dose CT for Patients with Clinically Suspected Acute Appendicitis: Optimal Strength of Sinogram Affirmed Iterative Reconstruction for Image Quality and Diagnostic Performance

Seung Ho Kim MD (Presenter); Janghee Lee MD; Kyeong Hwa Ryu MD; Een Young Cho MD; Jung Hee Yoon MD; Yun-Jung Lim; Choong K Eun MD

PURPOSE
To evaluate the optimal strength of Sinogram Affirmed Iterative Reconstruction (SAFIRE) to obtain the best image quality on ultralow-dose CT (ULDCT) and to compare its diagnostic performance with that of the half-dose CT (HDCT) for the diagnosis of acute appendicitis.

METHOD AND MATERIALS
This prospective study was IRB approved, and informed consent was obtained from all patients. A total of 102 consecutive patients (47 men, 55 women; mean age, 41.2 years; range, 15-82 years) with right lower quadrant pain underwent low dose CT, which consisted of enteric phase HDCT (120 kVp, 100 mAs, effective dose=3.6 mSv) and portal phase ULDCT (120 kVp, 30 mAs, 1.5 mSv). ULDCT images were reconstructed separately with five levels strength levels (S1-S5). Two blinded radiologists recorded scores for the subjective image quality of the ULDCT data set (S1-S5 and S0 [filtered back projection]) according to the European guidelines on quality criteria for CT, as well as confidence scores for the diagnosis of acute appendicitis on each set and HDCT. Histopathological findings served as a reference standard for diagnostic performance. For the quantitative analysis, CT image noise was measured for each set. Subjective image quality data were analyzed by Wilcoxon rank test, measured noise data by repeated measures ANOVA, and diagnostic performance by pair-wise comparison of ROC curves.

RESULTS
The study population consisted of 58 positives and 44 negatives. There was no significant difference in diagnostic performance between HDCT and ULDCT with any strength for both readers (AUC for reader 1, S0-S5=0.965, HDCT=0.933, p>0.05; for reader 2, S0=0.963, S1-S5=0.964. HDCT=0.961, p>0.05). The measured noise decreased as the strength increased from S0 to S5 (mean, 19.1>17.3>15.1>13.0>10.9>8.8, S4>S5, p CONCLUSION
Although measured noise declined as SAFIRE strength increased, S3 seems optimal for the best subjective image quality on ULDCT. The diagnostic performance of ULDCT with any strength is comparable to that of HDCT for the diagnosis of acute appendicitis.

CLINICAL RELEVANCE/APPLICATION
For reducing radiation dose and maintaining diagnostic performance in patients with clinically suspected acute appendicitis, ULDCT with S3 reconstruction can be recommended.

SSA06-09 • Imaging of Acute Appendicitis: Role of Low-Dose CT

Gopesh Mehrotra MBBS, MD (Presenter); Anupama Tandon MD, MBBS; Sanjay Gupta MD; Agarwal A Durgadas MD; Ajai K Srivastava

PURPOSE
The clinical diagnosis of acute appendicitis is not always accurate and twin objectives of imaging are to avoid negative appendicectomies and to diagnose alternate pathologies. There is controversy about optimal imaging techniques and accuracy of imaging modalities. This study compared the diagnostic accuracy of ultrasonography (USG), low dose CT and standard dose CT in diagnosis of acute appendicitis.

METHOD AND MATERIALS
Subjects were hundred patients of all age group and either sex with clinical suspicion of acute appendicitis. Informed consent and clearance from institutional ethical committee was taken. USG was conducted by two reviewers and Low dose CT images obtained at predefined protocols were presented to the two reviewers, who were blinded to clinical findings. Standard dose CT was done thereafter only if required (in 36 cases). Patients who refused consent, had contrast allergy, fulminant peritonitis or pregnancy were excluded from the study. A control group was 75 patients who had USG / CT done for non-GI complaints. The sensitivity, specificity, PPV, NPV of each modality and finding was calculated in comparison to operative findings.

RESULTS
The overall sensitivity, specificity, PPV, NPV and accuracy of USG was 98.6%, 96.2%, 96.2%, 96.2% and 97.4 and low dose CT was 95.9%- 97.2%, 95.7%, 96.6% and 88%-91.7% respectively. Standard dose CT had highest sensitivity and specificity of 100%. Overall detection rate of appendix was 88% on USG, 100% on standard dose CT and 95.6% to 87.6% on low dose CT. On USG statistically significant association was found between acute appendicitis and thickened wall of appendix (>2mm), fluid in lumen and peri-appendical fluid and on low dose CT between acute appendicitis and hyperdense wall, periappendical fluid and stranding. Mean radiation dose was 0.664mSv on low dose CT (eff mAs 20) and 4.286mSv on standard dose (eff mAs 120).

CONCLUSION
Overall diagnostic performance of USG and low dose CT was good and was almost similar. There were no false positives or negatives on imaging, using USG and low dose CT together and a diagnosis was possible in most cases. Alternative diagnoses were seen in 17% cases and could be detected in all cases.

CLINICAL RELEVANCE/APPLICATION
Low dose CT in association with sonography has the potential to be used as a less radiating alternative for standard dose CT for diagnosing acute appendicitis or alternative diagnosis.
SSA07-01 • Texture Analysis of MR Dixon Images in Primary Colorectal Cancer: Initial Experience Using PET-MRI

Balaji Ganeshan PhD (Presenter) *; Asim Afq RCR; Shonit Punwani MBBS; Alec Engledow; Daren Francis; Nicholas Rhys-Jones; Tan Arulampalam; Sanjay Dindyal; Omer Jailil; Anna Barnes; Celia O’Meara; Manuel Rodriguez-Justo; Peter J Ell MD *; Kenneth Miles *; Ashley M Groves MBBS *

PURPOSE
To describe the technique and initial results obtained from texture analysis of MR Dixon images derived from PET-MRI in primary colorectal cancer.

METHOD AND MATERIALS
10 consecutive prospectively recruited primary colorectal cancer patients (6 male and 4 female; Mean age 61.3±10.02) underwent PET-MRI including acquisition of Dixon images for attenuation correction, measurement of tumor fluorodeoxyglucose uptake (SUVmean) and MRI apparent diffusion coefficient (ADCmean). A parametric image of fractional water content was produced from the Dixon images from the ratio of the water-weighted image and the summed water- fat-weighted images. Fractional water images underwent texture analysis using a filtration-histogram method. Filtration highlighted image features ranging between approximately 2mm and 7mm diameter. Histograms of filtered images quantified as standard-deviation (SD) and proportion of positive pixels (PPP) were correlated against SUVmean and ADCmean using Spearman Rank Correlation.

RESULTS
The mean tumor fractional water content was 0.88 (range: 0.74 - 0.95). Fractional water content did not correlate significantly with ADCmean (rs = 0.358, p=0.310) and SUVmean (rs = -0.030, p=0.934). Fractional water content expressed as SD correlated negatively with ADCmean (rs = -0.75, p=0.013) with PPP values correlated positively with SUVmean ( rs = 0.75, p=0.013).

CONCLUSION
Texture analysis of Dixon images can potentially assess tumor water distribution. Tumor ADCmean and SUVmean measurements may be related to tumor water distribution in colorectal cancer.

CLINICAL RELEVANCE/APPLICATION
Texture analysis of Dixon images in colorectal cancer may potentially provide information about tumor biology with possible applications in personalized medicine.

SSA07-02 • CT Manifestations of the Mesorectal Fascia Invasion of Rectal Carcinoma

Chen Nan MD (Presenter) ; Kuncheng Li MD

PURPOSE
The total mesorectal excision (TME), which surgical removal of rectal tumor and the surrounding mesorectum along the mesorectal fascia (that is circumferential resection margin, CRM), has become the standard surgical method of rectal cancer which originated from the section below the pelvic peritoneum reflection. Therefore, to preoperatively comprehensive evaluate the state of mesorectal fascia is very important an impact on the decision of potential for TME surgical removal as well as whether neoadjuvant therapy should be administered. So, our Purpose is to evaluate the CT manifestations of the mesorectal fascia invasion of rectal carcinoma.

METHOD AND MATERIALS
Seventy-eight patients with rectal carcinoma which originated from the section below the pelvic peritoneum reflection underwent preoperative CT examinations and the operations were performed with TME method in 72 resectable tumor. Compared the CT characteristics of mesorectal fascia invasion of rectal carcinoma with the pathologic findings.

RESULTS
In 78 cases, 51 cases rectal carcinoma had penetrated through the rectal wall present patching-like, lining or mass shadows distributed within the peri rectal fat tissue on CT. Among them, none of rectal fascia was thicken on CT in 27 cases. In these cases, no tumor cells infiltrating was found in the CRM proved by pathology. The thickening of the rectal fascia present even or irregularly thickened was found in 24 cases on CT. In these cases, the invasion outside of rectal fascia into the pararectal space on CT and the CRM involvement proved by pathology was 11 cases and 13 cases, respectively. The e values was 0.818 and the p value was 0.001.

CONCLUSION
CT is valuable in identifying tumor invasion mesorectal fascia. The state of mesorectal fascia on CT is excellent agreement with the pathologic findings of CRM.

CLINICAL RELEVANCE/APPLICATION
It is very important for preoperative determination of resectability, surgical approach and prognosis of rectal carcinoma.

SSA07-03 • The Correlation of Radiologic Serosal Involvement in Rectal Cancer to Pathologic Assessment, and Comparison of Impact on Survival, Local Recurrence and Metachronous Peritoneal Carcinomatosis

Michael R Torkzad MD, PhD (Presenter) *; Faiz Dranichnikov; Hakan Ahlstrom; Peter Nygren; Lars Pahlman; Haile Mahteme MD, PhD

PURPOSE
To investigate the correlation between radiologic and pathologic assessment of serosa involvement in patient with rectal cancer, and also compare the impact of serosa involvement on survival, local recurrence and metachronous peritoneal carcinomatosis (MPC).

METHOD AND MATERIALS
100 consecutive patients diagnosed with T3 and T4 primarily rectal cancer between 2007 and 2008 made the basis of this study. Detailed radiologic analysis of magnetic resonance imaging (MRI) of rectum at the time of diagnosis of rectal cancer was performed by an experienced radiologist blinded to the clinical data. T4s was defined as tumor growing locally into the serosal layer; rT4s was when the radiologist made such an assessment and pT4s when the pathologist made such assessment. The clinical data at the time of diagnosis and surgery, and 4-5 years postoperative follow-up regarding survival and adverse outcomes (cancer-related mortality and recurrence) and development of MPC were recorded.

RESULTS
94 patients had complete clinical data of which 63 had MRI prior to treatment. 11 patients showed radiologic signs of local peritoneal involvement (rT4s), while 6 patients showed this at pathology (pT4s). Only two of these were assessed as T4s by both the radiologist and the pathologist. Cancer-related mortality and local recurrence rate were higher among rT4s patients than pT4s (55% vs. 33% and 58% vs. 17%, respectively with odds ratio of 1.67 and 3.49). The only two cases of MPC were seen among rT4s patients. Step-wise multivariate regression showed higher impact by rT4s than pT4s classification on survival, recurrence rate and MPC with adjusted correlation coefficients (R2) of 0.04, 0.15 and 0.14. rT4s staging was the only factor with adjusted R2 > 0.03 for development of MPC.

CONCLUSION
There seems to be a large discrepancy between rT4s and pT4s though the latter was usually after neoadjuvant therapy. rT4s showed higher impact on development of MPC, local recurrence and even cancer-related survival.

CLINICAL RELEVANCE/APPLICATION
Involvement of serosal layer in rectal cancer denotes a higher risk for metachronous development of peritoneal carcinomatosis, local
SSA07-04 • Diffusion Weighted Imaging for Evaluating Lymph Node Eradication after Neoadjuvant Chemoradiation Therapy in Locally Advanced Rectal Cancer

Kyeong Hwa Ryu MD (Presenter); Seungho Kim MD; Junghee Yoon MD; Yedaun Lee MD; Yun-Jung Lim; Choong K Eun MD

PURPOSE
To evaluate the added value of the diffusion-weighted imaging (DWI) for evaluating lymph node (LN) eradication after neoadjuvant chemoradiation therapy (CRT) in patients with locally advanced rectal cancer (LARC).

METHOD AND MATERIALS
Institutional review board approved this retrospective study and waived informed consent. Ninety-five consecutive patients (64 men, 31 women; mean age: 59 years, range: 32-82 years) with LARC (=T3 or LN metastasis) who underwent CRT and subsequent surgery, were enrolled in this study. All patients underwent pre-and post-CRT 1.5T rectal MRI with DWI (b=0, 1000). To evaluate the added value of the DWI for evaluating LN eradication after CRT, two blinded radiologists independently read the pre-and post-CRT T2-weighted images (T2WI) first and then the combined image set of the T2WIs and pre-and-post-CRT DWI with a four-week interval and recorded their confidence score for LN eradication with a 5-point scale on a per-patient basis. The diagnostic performances were compared between the two reading sessions for each reader by using pair-wise comparison of receiver operating characteristic curves. Histopathology reports served as the reference standard for LN eradication.

RESULTS
Study population consisted of LN-eradicated group (n=65) and non-eradicated group (n=30). The diagnostic performances did not significantly differ between the two reading sessions for both readers (AUC, for reader 1, 0.770, 0.774, p=0.8155; for reader 2, 0.794, 0.798, p=0.8588). The sensitivity, specificity and accuracy for LN eradication were stationary after adding DWI for both readers (for reader 1, from 88%, 67% and 80% to 88%, 73% and 83%, respectively; for reader 2, from 77%, 77% and 77% to 77%, 80% and 78%, respectively).

CONCLUSION
Adding DWI to T2WI provides no additional diagnostic benefit for evaluating LN eradication after CRT in patients with LARC.

CLINICAL RELEVANCE/APPLICATION
Adding DWI to T2WI provides no additional diagnostic benefit for evaluating LN eradication after CRT in patients with LARC.

SSA07-05 • Magnetic Resonance Imaging of Tumor Initiation and Progression, and Response to Vitamin D in a Mouse Model of Colitis and Colitis-associated Colon Cancer

Devkumar Mustafi PhD (Presenter); Urszula Dougherty MS; Erica Markiewicz BA; Xiaobing Fan PhD; Marc Bissonnette MD; Gregory S Karczmar PhD *

PURPOSE
Colon cancer is a leading cause of cancer-deaths in the US. Ulcerative colitis is causally linked to colitis-associated neoplastic progression but is difficult to detect and monitor non-invasively. Goals of this study were to determine MRI characteristics of early colitis-associated colon cancer and to assess vitamin D chemopreventive efficacy.

METHOD AND MATERIALS
This study included CF1 female control mice (n=12), and mice treated with a-azoxymethane i.p. and dextran sulfate sodium in the drinking water (n=25) to induce colitis and colon cancer. Mice were fed a Western diet or Western diet supplemented with vitamin D (500 µg/kg chow). Western diets are relatively deficient in vitamin D and calcium. Mice were studied serially using anatomic and dynamic contrast enhanced MRI (DCEMRI) with a Gd-based contrast agent in vivo MR and ex vivo histological images were co-registered using an agar based color-coded phantom in a flexible tube (2 mm o.d.) that was inserted via the rectum to the cecum. The phantom provided visual and MRI-detectable reference markers to co-register in vivo and ex vivo images.

RESULTS
We demonstrated that: 1) a visible reference marker could be used to successfully co-register MRI abnormalities with histological features identified in HandE stained sections; 2) T2 values distinguished normal colon from colitis, and from focal neoplastic lesions (trans values assessed by DCEMRI (a measure of perfusion/capillary permeability) reliably distinguished normal colon from tumor (0.12±0.01 min-1 vs. 0.61±0.05 min-1, respectively, p=0.001), p3-fold larger adjacent to early colonic tumors compared to vessels in control mice, suggesting that MRI might be used to detect dilated blood vessels as biomarkers of early colorectal cancer; 5) Vitamin D reduced the number of colonic tumors and degree of inflammation detected by MRI (p<0.05).

CONCLUSION
A novel technique was successfully developed to co-register MR and histological images. Several reliable image-based markers for colitis and colon cancer were identified. These MRI methods could monitor the chemopreventive efficacy of vitamin D in this model in real time and without sacrifice.

CLINICAL RELEVANCE/APPLICATION
Non-invasive MRI/DCEMRI studies of colitis and colon cancer in mice will improve understanding of these diseases, produce new MRI markers to improve diagnosis, and guide development of new therapies.

SSA07-06 • Neoadjuvant Radiochemotherapy Response Evaluation with Magnetic Resonance and FDG-PET/CT in Rectal Cancer Patients: Predictive Value of Combined Quantitative Parameters of ADC and SUV Compared with TRG at Histology

Davide Ippolito MD (Presenter); Pietro A Bonaffini MD; Davide Fior MD; Cristina Capraro MD; Chiara Trattenero MD; Sandro Sironi MD

PURPOSE
To determine the clinical value of functional imaging by analyzing quantitative parameters of ADC and SUV max values before and after chemoradiation therapy in prediction of tumor response of patients with rectal cancer, correlated with the histologic examination expressed as tumor regression grade.

METHOD AND MATERIALS
A total of 45 patients with biopsy proven diagnosis of rectal carcinoma were enrolled in our study. All patients underwent a whole body 18 FDG PET/CT scan and a pelvic MR examination before(PET 1, MR 1) and after the neoadjuvant chemoradiation therapy(PET 2, MR 2). Subsequently all patients underwent total mesorectal excision and the histological results were compared with imaging findings. MR scanning, performed on 1,5 T magnet(Philips,Achieva), comprised T2-weighted multiplanar imaging and in addition DW images with b-value of 0 and 1000 mm2/sec. On PET/CT the SUVmax of the rectal lesion were calculated in PET1 and PET2. The percentage decrease of SUVmax(SUV) and ADC(AUD) values from baseline to presurgical scan were assessed and correlated with pathologic response classified as tumor regression grade (Mandard’s criteria;TRG 1= complete regression, TRG5= no regression).

RESULTS
At histological examination, according to Mandard’s criteria, 29 tumors(68%) showed complete or subtotal regression(TRG 1-2) and were classified as responders;16 tumors(32%) were classified as non-responders(TRG3-5). Considering all patients the mean values of SUVmax in PET 1 was higher than mean value of SUVmax in PET 2 (p =0.02) with high sensitivity and specificity. Combining in a single analysis median quantitative value, the PPV in predicting the different group category response, related to TRG system, presented an AUC of 96%, higher than DWI (88.2%) or SUVmax (93.3%).

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CONCLUSION
Combination of PET-CT and MR imaging, evaluating changes in glucose metabolism and ADC, allows the identification of spatially distinct regional responses to therapy within tumor tissues, with higher sensitivity than other method alone.

CLINICAL RELEVANCE/APPLICATION
In era of PET/MRI scanner, the combination of DWI and PET/CT represents the most feasible method to evaluate LARC patients, with accuracy values higher than those reported for other imaging technique.

SSA07-07 • Most Accurate Selection of Complete Responders After Chemoradiation for Rectal Cancer with a Combination of T2-weighted MRI, Diffusion-weighted MRI and Endoscopy
Monique Maas MD (Presenter); Doenja M Lambregts MD, PhD; Luc Heijnen; Milou Martens; Jeroen Leijtens; Meindert Sossef; Karel Hulsee; Gerard L Beets MD, PhD; Regina G Beets-Tan MD, PhD

PURPOSE
Chemoradiation (CRT) for rectal cancer leads to complete tumour response (CR) in 15-25% of the cases. Accurate identification of a CR is necessary to allow for less invasive treatments (e.g. local excision or wait-and-see). Standard imaging cannot accurately identify a CR due to incorrect overestimation of fibrosis as residual tumour. Aim was to evaluate what is the best strategy to identify patients with a CR by use of T2W MRI, DWI and endoscopy.

METHOD AND MATERIALS
49 patients underwent CRT and restaging consisting of T2W-MRI, DWI and endoscopy 8 weeks after completion of CRT. One reader scored the T2W images followed by immediate evaluation of the DWI images with the T2W images at his disposal. A second reader scored the endoscopy images. Readers were blinded for histology and each other’s results. Scoring was performed with a confidence level score (0=definitely residual tumour, 4=definitely CR).

RESULTS
Of the 49 patients, 18 had residual tumour and 31 had a CR. The AUCs for T2W-MRI, T2+DWI and endoscopy were 0.71, 0.78 and 0.88, respectively. Corresponding sensitivities and specificities were 39%and87% for T2W, 39%and93% for T2+DWI and 67%and97% for endoscopy. When a combination of MRI (T2W and DWI) with endoscopy was used the highest accuracy was reached: 0.91.

CONCLUSION
The combination of endoscopy, T2W-MRI and DWI leads to a very high accuracy for the identification of patients with a CR after CRT for rectal cancer. Endoscopy corrects for overestimation of fibrosis as residual tumour with MRI. MRI provides a low risk for missing residual tumour and thus guarantees a safe selection process. It is therefore highly recommendable to use this combination of endoscopy and T2W-MRI with DWI to select patients with a CR after CRT, particularly now less invasive treatment is increasingly being considered as an alternative for standard TME.

CLINICAL RELEVANCE/APPLICATION
Use of endoscopy with T2WMRI+DWI for the selection of a CR after CRT for rectal cancer leads to a high accuracy and is recommended for restaging when considering less invasive treatment instead of TME.

SSA07-08 • Diffusion-weighted MR Imaging for the Follow-up of Patients after Primary Surgical and Non-surgical Treatment for Rectal Cancer
Doenja M Lambregts MD, PhD (Presenter); Max Lahaye MD, PhD; Luc Heijnen; Monique Maas MD; Milou Martens; Regina G Beets-Tan MD, PhD; Gerard L Beets MD, PhD

PURPOSE
Detection of local recurrences after primary treatment of rectal cancer is crucial in order to allow for timely surgical intervention. Standard imaging is known to experience difficulties in differentiating between post-treatment effects (inflammation/fibrosis) and recurrent tumor. Diffusion-weighted MRI (DWI) has in various studies shown to be a powerful technique for the detection of tumors. Hence, DWI may also be a promising tool for follow-up (FU) after treatment. Aim of this study was to evaluate the diagnostic value of DWI for the FU of patients after primary surgical or non-surgical treatment for rectal cancer.

METHOD AND MATERIALS
The study group consisted of 117 patients who had previously undergone rectal cancer treatment, consisting of either standard surgical resection +/- neoadjuvant (chemo-)radiotherapy (n=36), a local transanal excision (n=40, of which 15 after chemoradiotherapy), or a non-operative wait-and-see policy (n=41). During clinical FU all patients underwent one or more FU-MRIs (1.5T) including DWI (highest b-value b1000), as part of routine FU or because of a suspected local recurrence (e.g. clinical complaints or rising CEA levels) after surgery. Two readers in consensus evaluated each MRI and scored the b1000 DWI-images as no high signal, high signal, or not adequately assessable due to artefacts.

RESULTS
Patients underwent a mean number of 3 FU-scans (range 1-11) with a mean FU-time of 44 months (4-144). 27/117 patients developed a suspected of recurrence or not adequately asessable due to artefacts. Of the 49 patients, 18 had residual tumour and 31 had a CR. The AUCs for T2W-MRI, T2+DWI and endoscopy were 0.71, 0.78 and 0.88, respectively. Corresponding sensitivities and specificities were 39% and 87% for T2W, 39% and 93% for T2+DWI and 67% and 97% for endoscopy. When a combination of MRI (T2W and DWI) with endoscopy was used the highest accuracy was reached: 0.91.

CONCLUSION
Detection of local recurrences after primary treatment of rectal cancer is crucial in order to allow for timely surgical intervention. Standard imaging cannot accurately identify a CR due to incorrect overestimation of fibrosis as residual tumour. A aim was to evaluate what is the best strategy to identify patients with a CR by use of T2W MRI, DWI and endoscopy.

CLINICAL RELEVANCE/APPLICATION
Use of endoscopy with T2WMRI+DWI for the selection of a CR after CRT for rectal cancer leads to a high accuracy and is recommended for restaging when considering less invasive treatment instead of TME.

SSA07-09 • MRI with DWI Compared with FDG-PET/CT in the Evaluation of Suspected Local Recurrence in Rectal Cancer
Matteo Cappucci MD (Presenter); Marco Di Girolamo MD; Vincenzo David MD; Daniela Prosperi; Stefania Durante; Elsa Iannicelli MD

PURPOSE
In case of suspicion of locally recurrent rectal cancer, the use of MRI with diffusion-weighted MRI or [18F]-fluorodeoxyglucose (FDG) PET/CT still remains debated. Our purpose was to compare the two imaging modalities in the discrimination between local recurrence and post-treatment scar tissue.

METHOD AND MATERIALS
Since September 2010, all patients treated with neo-adjuvant chemio-radiotherapy and surgical resection for rectal cancer were referred, in case of high suspicion of local recurrence during follow-up, for MRI and PET/CT. 25 patients were enrolled (17M, 8F; mean age: 64.1) and the mean time of the diagnostic evaluation after surgical resection was 14 months. MRI was performed with 1.5T superconductiv magnet with TSE T2-w. scan on sagittal, axial and coronal planes, DWI axial scans (b values: 50,400,800) and post-contrast fat saturated Flash 2D T1-w. axial scans. All exams were reported by two radiologists in consensus. Total-body PET/CT
images were acquired 60 minutes after i.v. injection of 185 MBq FDG and reported by two physicians who were unaware of MRI findings. In case of concordantly negative findings, the patients followed a routine follow-up. Patients with concordantly positive findings or discordance were subjected to a CT-guided biopsy or surgical excision for histological evaluation.

RESULTS
MRI+DWI and PET/CT were concordantly negative in 15pts and concordantly suggestive of recurrence in 7pts. The patients with concordantly findings of fibrosis remained disease-free after 10 months follow-up. In 6pts the concordantly imaging suggestion of recurrence was confirmed by biopsy while in one patient histology disconfirmed the suspected diagnosis. A discordance with negative MRI+DWI and positive PET-CT was found in 3 cases: in 2pts the histological specimen was negative (2 PET/CT false positive) while in 1 patient a recurrence was found at biopsy (MRI+DWI false negative). The sensitivity, specificity and diagnostic accuracy of MRI+DWI was respectively 86%, 94% and 92% while for PET/CT was 100%, 83% and 88%

CONCLUSION
MRI+DWI shows higher specificity than PET/CT, especially in case of active inflammatory tissue while PET/CT has a higher sensitivity than MRI+DWI and can detect distant metastasis. MRI is also essential in the local recurrence surgical planning.

CLINICAL RELEVANCE/APPLICATION
MRI with DWI shows higher specificity than PET/TC in the evaluation of suspected local recurrence rectal cancer and it is recommended.

### Gastrointestinal (Hepatic Fibrosis Imaging)

**Sunday, 10:45 AM - 12:15 PM • E450B**

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<td><strong>Moderator</strong></td>
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**SSA08-01 • The Effect of Echo Times on the Accuracy of Susceptibility Weighted Magnetic Resonance Imaging in Staging Liver Fibrosis**

Csilla Balassy MD (Presenter) ; Diana S Feier MD ; Friedrich Wrba ; Stephan Witoszynskyj ; Gert Reiter * ; Ahmed Ba-Ssalamah MD

**PURPOSE**
To assess the effect of echo-sampling on the accuracy of magnetic resonance (MR) susceptibility-weighted imaging (SWI) to detect and stage liver fibrosis in patients with chronic liver diseases (CLD), using histology as reference standard.

**METHOD AND MATERIALS**
This prospective study was approved by the local ethics committee. All subjects gave written informed consent. Sixty-eight consecutive patients (mean age 55.86 years; 60% males) with CLD and histologically proven liver fibrosis were included. Liver fibrosis was evaluated according to the Metavir scoring system. SWI MRI sequences were performed on a 3 Tesla unit and data were collected at two different echo times (TE), 2.5 ms and 10ms. Signal intensity (SI) of the liver and spinal muscle was defined using region-of-interest measurements and liver-to-muscle signal intensity ratios (2.5TE LMR and 10TE LMR) were calculated. The diagnostic performance of both LMR in staging liver fibrosis was assessed using sensitivity (Se%), specificity (Sp%) and area under receiver operating characteristics (AUROC) analysis.

**RESULTS**
Histology resulted F0 (n=13, 19.4%), F1 (n=6, 9%), F2 (n=8, 11.9%), F3 (n=12, 17.9%), F4 (n=28, 41.8%). Both 2.5TE LMR and 10TE LMR correlated strongly with liver fibrosis (r=-0.74, p<0.001). Swi was a promising non-invasive tool to detect and stage liver fibrosis in CLD patients, having increased accuracy with higher TE values.

**CLINICAL RELEVANCE/APPLICATION**
Implementation of imaging parameters as assessed in our study will enable improved and accurate assessment of liver fibrosis in patients with CLD using SWI.

**SSA08-02 • Intravoxel Incoherent Motion Magnetic Resonance Imaging of the Liver: Diagnostic Accuracy in Classifying the Severity of Liver Fibrosis**

Sae Rom Chung MD (Presenter) ; Seung Soo Lee MD ; Namkug Kim PhD ; Eunki Kim ; Seong Ho Park MD * ; So Yeon Kim MD ; Jae Ho Byun MD ; Moon-Gyu Lee MD

**PURPOSE**
To investigate the relationship of liver ADC and intravoxel incoherent motion (IVIM) parameters with liver fibrosis and to evaluate the diagnostic performance of these parameters in classifying the severity of liver fibrosis.

**METHOD AND MATERIALS**
RESULTS
CONCLUSION
CLINICAL RELEVANCE/APPLICATION
IVIM magnetic resonance imaging of the liver can be used as a diagnostic test to assess the severity of liver fibrosis.

**SSA08-03 • Correlation of Magnetic Resonance Elastography (MRE) with Hepatic Fractional Extracellular Space (fECS) - Preliminary Findings**

Sudhakar K Venkatesh MD, FRCR (Presenter) ; Bogdan Dzyubak BS ; Benjamin M Yeh MD * ; Joel G Fletcher MD * ; Jeff L Fidler MD * ; Naoki Takahashi MD * ; David M Hough MD ; Jayant A Talwalkar MD * ; Richard L Ehman MD * ; Adam J Weisbrad MD

**PURPOSE**
The purpose of the study was to evaluate the correlation of two promising MRI techniques of measuring diffuse liver disease: magnetic resonance elastography (MRE) and hepatic fractional extracellular space (fECS) measured with gadolinium (Gd-DTPA) enhanced MRI.

**METHOD AND MATERIALS**
Thirty-two consecutive clinical patients underwent routine liver MRI examinations. The MRI protocol included MRE as well as Gd-DTPA enhanced equilibrium phase (10-15 minute delay) sequences. MRE was performed with a standard GRE-based sequence to calculate liver
Liver stiffness. Hepatic fECS (%) was calculated from equilibrium phase liver and aortic enhancement normalized to the pre-enhancement signal and hematocrit. Pearson’s correlation coefficient between MRE and fECS was calculated. Comparison of mean fECS values of normal and elevated liver stiffness group was also performed using the current clinical cut-off value of 2.93kPa for detection of liver fibrosis.

RESULTS
The liver stiffness and fECS of the study population ranged from 1.68kPa to 8.6kPa and 17.5% to 40.1% respectively. There was good correlation between MRE measures of liver stiffness and equilibrium phase measures of fECS (Pearson’s correlation coefficient r=0.86, 95% CI, 0.73-0.93, p

CONCLUSION
Liver stiffness with MRE correlates strongly with fECS. Future study of these methods is warranted improve the multiparametric evaluation of diffuse liver disease.

CLINICAL RELEVANCE/APPLICATION
MRE correlates strongly with hepatic fECS suggesting a complementary role in the evaluation of diffuse liver disease.

SSA08-04 • Liver Fibrosis Staging: Magnetic Resonance Elastography Is Better than Liver Biopsy

Hiroyuki Morisaka MD (Presenter); Utaro Motosugi MD; Shintaro Ichikawa MD; Katsuhiro Sano MD; Satoshi Ikenaga; Tadao Nakazawa MD, PhD; Tetsuo Kondo MD, PhD; Tomoaki Ichikawa MD, PhD *; Ryouhei Katoh MD, PhD

PURPOSE
Liver biopsy for the staging of liver fibrosis has some clinical concerns; sampling errors, variability and reproducibility. In this study, we aimed to compare magnetic resonance elastography (MRE) of the liver with liver biopsy specimens for liver fibrosis staging by using surgically resected samples as a reference.

METHOD AND MATERIALS
In this retrospective study, we included 55 patients with chronic liver disease who underwent preoperative MRE on a 1.5 or 3-Tesla clinical MRI scanner and subsequent surgical liver resection. Liver biopsy specimens were obtained from 55 surgically resected liver tissues by using an 18-gauge biopsy needle; the sample size was more than 15 mm, and the specimens were stained with Masson trichrome. Whole sections were used as a reference for liver fibrosis. Liver stiffness (kPa) was measured using MRE, and the results were divided into 5 stages corresponding to the METAVIR scoring system. Liver fibrosis was graded on biopsy specimens and whole sections by using the METAVIR system. The concordance rate (kappa value) with reference fibrosis grades in the two methods was calculated. The proportion of correct diagnosis was compared between the two methods.

RESULTS
The kappa coefficient value between MRE staging and the reference fibrosis staging was 0.49 (moderate agreement) and that between the biopsy staging and the reference fibrosis staging was 0.18 (slight agreement). The proportion of correct diagnosis of MRE was significantly higher than that of biopsy specimens (33/55 vs. 18/55, respectively; p = 0.004).

CONCLUSION
A substantial sampling error of biopsy specimens was observed. MRE is an accurate and promising method of noninvasive liver fibrosis staging as compared with biopsy specimens.

CLINICAL RELEVANCE/APPLICATION
Liver MR elastography is more accurate than liver biopsy specimens in liver fibrosis staging and can be serve as biopsy in clinical practice.

SSA08-05 • Automated Technique for Hepatic MR Elastography Analysis: Comparison to Skilled Human Interpretation

Bogdan Dzyubak BS (Presenter); Armando Manduca PhD *; Joel P Felmlee PhD; Kevin J Glaser *; Sudhakar K Venkatesh MD, FRCP; Richard L Ehman MD *

PURPOSE
To test the performance of an automated technique for the analysis of clinical MR Elastography (MRE) images.

METHOD AND MATERIALS
In a retrospective analysis of 64 MRE cases performed for fibrosis screening, the performance of an automated algorithm (A) was compared to that of clinical readers (R), with gold standard (G) measurements provided by a radiologist highly experienced with MRE. The algorithm presented here has been developed to fully automate MRE ROI selection and yield a standardized stiffness measurement. First, a crude outline of the liver was found by using the known relative positions and intensities of the dominant tissue types in the abdominal images (abdominal fat, lung, liver, and other). A Random Walker segmentation was subsequently run on the MR magnitude images to capture liver tissue and exclude vessels, and then again on the reconstructed stiffness images to remove partial-volume effects. The average stiffness from the ROIs was then calculated. To test the ability of the algorithm to reproduce manual measurements, a conventional diagnostic threshold of 2.93 kPa was used to separate patients into normal (below) and fibrotic (above) based on the results of the three analysis methods, and the diagnostic accuracy of A with respect to G was compared to that of R. Additionally, the absolute percent differences in the measured stiffness between R and G were compared to the differences between A and G using a Wilcoxon Signed-Rank test.

RESULTS
Of the 64 cases, 28 were classified by G as having fibrosis. The accuracy of A for diagnosing fibrosis was 92% and was superior to R’s accuracy of 84%. It was shown to be statistically non-inferior within 10% accuracy with a p

CONCLUSION
The fully automated algorithm presented here has been shown to yield results as accurate as the manual methods currently used in the clinic. If implemented as a standard, it can remove biases due to inter-reader variability as well as facilitate future MRE developments by creating a consistent framework for ROI selection and artifact exclusion.

CLINICAL RELEVANCE/APPLICATION
The automated algorithm presented here can provide a standard for the practice of clinical hepatic MRE that reduces the measurement variability and improves diagnostic accuracy.

SSA08-06 • Ultrasound Elastography with Concomitant Liver Biopsy: Comparison of Acoustic Radiation Force Impulse (ARFI) Measurement with Histopathological Grading

Minal C Jagtiani MBBS, MD (Presenter); Philip J Shorvon FRCP, FRCPC; Paul Bassett; Kesavan Kanniah; Paul Tadrous; David J Sherman

PURPOSE
To correlate ultrasound elastography stiffness measurements in chronic liver disease patients with concomitant liver biopsy histopathological scores of fibrosis.

METHOD AND MATERIALS
Patients from January 2010 through January 2013 (n= 161; 84 males) who underwent ultrasound guided liver biopsy for chronic liver disease, performed by an Attending Radiologist with a specialist interest in liver imaging, were assessed prospectively. All patients also underwent ultrasound elastography for liver stiffness immediately prior to the biopsy by the same Attending Radiologist. Elastography measurements (ARFI method shear velocity m/ sec; mean of 10 measurements) were obtained in the same anatomical region of the liver as the biopsy. All histopathology reports were scored by a specialist Attending Pathologist. ISHAK and Metavir fibrosis scores were then
correlated with the ARFI measurements using Spearman's rank correlation. A sub-group analysis was also performed to compare these variables in patients with viral hepatitis.

RESULTS
Data for 159 patients (mean age 49 ± 14 years) were available. The mean elastography measurement was 1.7 ± 0.7 m/sec. The results demonstrated statistically significant associations between higher histological grading and increasing ARFI measurements in all analyses. Significant correlation was obtained between the ARFI measurement and both the Ishak (r value= 0.58; p value < 0.001) and Metavir scores (r value= 0.58; p value < 0.001) in all groups. For the subgroup of patients with viral hepatitis (n= 85), the correlation coefficient for Ishak and METAVIR scores were 0.51 and 0.53 respectively with p values < 0.001 in both groups.

CONCLUSION
To the best of our knowledge, this is the first study with a large cohort to assess ARFI elastography measurements and liver biopsy taken concomitantly and validating its accuracy in 'all-comers'. It has demonstrated a highly significant statistical correlation between elastography measurements by the ARFI method and the histological grading of fibrosis.

CLINICAL RELEVANCE/APPLICATION
This study demonstrates that ARFI elastography can be performed as part of a routine ultrasound study of the liver to aid in the assessment of liver fibrosis thus optimising patient pathway.

SSA08-07 • Accuracy of Shear-wave Elastography to Determine the Degree of Liver Fibrosis in Patients with Hepatitis C Virus Infection
Anand Rattansingh (Presenter) ; Hosein Amooshahi MSc ; Sandra Fischer MD ; Morris Sherman * ; Richard Kirsch MD, PhD ; Mostafa Atri MD

PURPOSE
The purpose of this study was to determine the accuracy of shear-wave elastography in grading fibrosis in patients with Hepatitis C virus (HCV) infection.

METHOD AND MATERIALS
105 patients (85 Men and 20 women), mean age 56 (range23-74) with HCV infection underwent US guided random core biopsy and shear-wave elastography on the same day. Elastography was performed on a Supersonic machine using a 3.5 MHz probe. Five samples were obtained from the right lobe of liver of each patient and averaged to determine stiffness measured as kilo-Pascal (kPa). The same pathologist reported all pathology specimens using METAVIR fibrosis scoring 0 to 4. Student's t-test was used for comparison of continuous variable, and ROC curve to calculate Area Under Curve (AUC).

RESULTS
There were 82 patients with no to moderate fibrosis (METAVIR 0 to 2) and 23 with severe fibrosis or cirrhosis (METAVIR 3and4) with the prevalence of severe fibrosis or cirrhosis being 22% (23/105). Stiffness ranged from 3.2 to 26.4 (mean 9.6) kPa. Stiffness of livers with no or moderate fibrosis on pathology ranged from 3.2 to 26.4 (mean 9.1) kPa and for severe fibrosis and cirrhosis 6.2 to 24.3 (mean 12.2) kPa (p=0.01). ROC curve showed an AUC of 0.78 (CI: 0.68-0.89) (p < 0.0001).

CONCLUSION
Shear-wave elastography has the potential to discriminate between = moderate liver fibrosis and severe liver fibrosis or cirrhosis in patients with HCV infection.

CLINICAL RELEVANCE/APPLICATION
Ultrasound shear-wave elastography has the potential to assess parenchymal stiffness of the liver with good correlation to degree of fibrosis.

SSA08-08 • Comparison of Liver Stiffness Measurement by Acoustic Radiation Force Imaging (ARFI) and Fibroscan for the Non-invasive Diagnosis of Liver Fibrosis
Victoire Cartier MD (Presenter) ; Derek Bardou ; Jerome Boursier ; Jerome Lebigot MD ; Sophie Michalak ; Isabelle Fouchard-Hubert ; Christophe Aube MD, PhD *

PURPOSE
To compare ARFI and Fibroscan in an intention-to-diagnose (ITD) basis for the non-invasive diagnosis of liver fibrosis in chronic liver disease.

METHOD AND MATERIALS
219 patients with chronic liver disease and liver biopsy were prospectively included. Liver stiffness measurements (m/s) were performed by ARFI (right lobe: ARFI-D, left lobe: ARFI-G) and Fibroscan (right lobe). ARFI-DG corresponded to the median value of all valid measurements obtained in both lobes. Reference for fibrosis was Metavir F staging. Diagnostic accuracy was evaluated using AUROC and Obuchowski index (adjusted AUROC). For ITD analysis, failures of elastographic measurement were replaced by the median value of all valid measurements in the opposite group of the biopsy diagnosis.

RESULTS
Fibrosis stage prevalence was F2: 50%, F3: 26% and F4: 9%. Rate of measurement failure was ARFI-D or ARFI-G: 0.5% versus Fibroscan: 5.9% (p=0.002). In per-protocol analysis, AUROCs of Fibroscan were significantly higher than those of ARFI-D for each diagnostic target (p

CONCLUSION
ARFI and Fibroscan have close and high accuracy for liver fibrosis diagnosis. Due to a higher failure rate, accuracy of Fibroscan decreases in the ITD analysis but remains not significantly different from ARFI accuracy.

CLINICAL RELEVANCE/APPLICATION
The high feasibility and reliability of ARFI could be useful to detect undiagnosed significant fibrosis during any abdominal ultrasound examination, with a high diagnostic accuracy.

SSA08-09 • Simply Combine the Results of Multiple Elastographies and Serum Fibrosis Markers Using Bayesian Prediction for Noninvasive Liver Fibrosis Staging
Utaroh Motosugi MD (Presenter) ; Katsuhiko Sano MD ; Hiroyuki Morisaka MD ; Shintaro Ichikawa MD ; Tomoaki Ichikawa MD, PhD *

PURPOSE
Elastography, using ultrasound or MRI, has been applied to liver fibrosis staging, while serum fibrosis marker has commonly been used to predict the fibrosis stage. The combined use of elastographies and fibrosis marker may be a superior method to their individual use. This study was aimed to evaluate the usefulness of Bayesian prediction method to combine the results of elastographies and serum fibrosis marker for noninvasive liver fibrosis staging.

METHOD AND MATERIALS
This study included 20 cases of chronic liver disease. The pathological fibrosis staging were performed with the specimen of partial heptatecomy by using METAVIR staging system in all cases. The use of Bayesian prediction to stage liver fibrosis can provide the possibility of the fibrosis stages on the basis of the results of elastographies or serum fibrosis markers. We used aspartate transverse-to-platelet ratio index (APRI) as a serum fibrosis marker and ultrasound transient elastography (UTE) and MR elastography (MRE) as imaging-based elastographies for liver fibrosis stage estimation. We compared the accuracy of fibrosis staging and the...
Liver Remnant Volume Gain

SSA23-02 • Transarterial Embolization of Renal Artery Pseudoaneurysms Following Partial Nephrectomy

Nakul Gupta MD (Presenter) ; Anish A Patel ; Kamran Ahrar MD ; Judy U Ahrar MD ; Alda L Tam MD * ; Michael J Wallace MD * ; Sanjay Gupta MD

PURPOSE
To describe the presentation, endovascular management, outcome, and effect on renal function of selective transarterial embolization of renal artery pseudoaneurysms and arteriovenous (AV) fistulae in patients following open or laparoscopic partial nephrectomy.

METHOD AND MATERIALS
The medical and imaging records of 25 patients who were referred for embolization of renal artery pseudoaneurysms or AV fistulae after partial nephrectomy were retrospectively reviewed for the following parameters: size and number of primary tumors, presenting symptoms, number and type of angiographic abnormalities, embolization technical details, outcome, and estimated glomerular filtration rates (eGFRs) prior to and at multiple time points following embolization.

RESULTS
24 patients had primary renal tumors, 1 patient had a pancreatic tumor directly invading the kidney. The median time between surgery and presentation was 11 days (range, 1 day to 502 days; mean, 38 days). Most patients (n=23; 92%) were symptomatic, presenting with gross hematuria, flank pain, or both. In 2 patients, pseudoaneurysms were found incidentally on follow-up CT scans. Angiography revealed pseudoaneurysms with 1(p=5) or without (n=20) AV fistulae. 16 patients (64%) had multiple pseudoaneurysms, often involving multiple segmental renal vessels. Selective embolization was performed with coils alone (n=20) or in combination with cyanoacrylate glue (n=5). Multiple vessels were embolized in 14 patients (56%). Cessation of bleeding was achieved after one (n=22) or two (n=3) embolization sessions in all patients. The median follow-up was 14 months. The mean eGFR values (in mL/min/1.73m²) prior to and at multiple time points following embolization were 59.2, 63.4, and 66.6, respectively. One patient had transient worsening of renal function 3 days after embolization.

CONCLUSION
Most patients with renal artery pseudoaneurysms after partial nephrectomy present in the immediate postoperative period with hematuria and/or flank pain. The majority of these patients show multiple pseudoaneurysms, often requiring selective embolization of multiple vessels. Transarterial embolization is a safe and effective treatment option with no long-term adverse effect on renal function.

CLINICAL RELEVANCE/APPLICATION
Transarterial embolization is a safe and effective treatment for renal artery pseudoaneurysms resulting from partial nephrectomy with no long-term adverse effect on renal function.

SSA23-03 • Particle only Embolization vs. Particle Embolization with Additional Plug/Coil Embolization - Comparison of Future
**Liver Remnant Volume Gain**

Dominik Geisel MD; Dirk Schnapauff MD; Martin Stockmann MD; Maciej Malinowski; Timm Denecke MD; Bernhard Gebauer MD (Presenter) *

**PURPOSE**
To analyze volume gain of the future liver remnant (FLR) after right portal vein embolization (PVE) in patients who received particle only embolization compared to patients who received particle embolization with additional central plug and/or coil embolization.

**METHOD AND MATERIALS**
Patients who received PVE in our institution were retrospectively analyzed. Right PVE was performed either with particle only (PO) embolization or additional central plug and/or coil embolization (CP/C). All patients enrolled had a CT or MRI scan before PVE and before operation, which were used for volumetry of the future liver remnant (FLR).

**RESULTS**
Of 75 patients 40 had PO embolization and 35 additional CP/C embolization. Age, sex, tumor entities and time from PVE to preoperative imaging were comparable in both groups. Tumor entities included cholangiocarcinoma (n = 52), metastasis from colorectal cancer (n = 14), hepatocellular carcinoma (n = 2) and other entities (n = 7). FLR volume before PVE was 329 ± 121 ml in the PO group and 333 ± 135 ml in the CP/C group and 419 ± 135 ml respectively 492 ± 165 ml before operation. Average volume gain was significantly higher in the CP/C than in the PO group with 53.3 ± 34.5% vs. 30.9 ± 28.8% (p = 0.002).

**CONCLUSION**
Right portal vein embolization with additional central plug and/or coil embolization leads to a significantly higher gain in FLR volume than embolization with particles alone.

**CLINICAL RELEVANCE/APPLICATION**
Right portal vein embolization with additional central plug and/or coil embolization should be preferred over particle only embolization.

**SSA23-04** • Experimental Study of Selective Portal Vein Embolization for Nonalcoholic Steatohepatitis in Rabbit Model

Sadao Hayashi MD (Presenter); Yasutaka Baba MD; Shunichiro Ikeda BS; Hiroaki Navago; Tetsuya Shinohara; Michiyu Higashi PhD; Ryozo Kamimura; Toshihiro Nakazono; Teruo Komokata; Masayuki Nakajo PhD

**PURPOSE**
Portal vein embolization (PVE) is now widely accepted as a useful preoperative procedure in selected patients undergoing extended hepatectomy. However, the influence of PVE on the liver parenchyma with steatohepatitis has not been fully elucidated. To evaluate the influence of PVE on the rabbit liver parenchyma with nonalcoholic steatohepatitis (NASH) compared with normal liver.

**METHOD AND MATERIALS**
Seventeen male New Zealand rabbits were divided randomly into the normal control group (n = 6) which was fed with a standard diet for 2 weeks and the NASH group (n = 11) which was fed with a high-fat diet (standard diet + 10% lard + 2% cholesterol) for 2 weeks. Thereafter, PVE was performed for the left lobe of each group with 1 ml absolute ethanol and micro coils. All procedures were performed successfully. Rabbits were sacrificed 2 weeks after the PVE. All hepatic specimens were examined by HE staining and immunohistochemical staining of heat shock protein 70 (HSP70). NASH stage, NASH grade and sinusoidal obstruction syndrome (SOS) score were evaluated used by HE staining. When less than 20% were stained, the specimen was considered as HSP expression negative.

**RESULTS**
Two of 11 NASH rabbits died of liver failure 2 days after PVE. The embolized lobe showed significantly higher NASH stage (p = 0.43) and grade (p = 0.009) and severe SOS score (p = 0.03) in the NASH group than in the normal control group. HSP70 expression was significantly lower in the NASH embolized lobe than in the normal control embolized lobe (p = 0.04).

**CONCLUSION**
The rabbit fed with the present high-fat diet can be a NASH model. PVE induced severe sinusoidal obstruction damage in the embolized steatohepatitis lobe than in the embolized normal lobe. HSP70 induction in the embolized lobe was suppressed in the NASH model. These findings suggest that the same severe damage may occur in the embolized lobe and the risk of unexpected fatal liver damage cannot be excluded in the patients with NASH after PVE.

**CLINICAL RELEVANCE/APPLICATION**
PVE should be performed carefully even for the patients with NASH.

**SSA23-06** • Needle Interventions in a Phantom Model: Real-time 3D Fluoroscopy Guidance Using Cone-beam CT versus Conventional CT Guidance

Noboru Maeda (Presenter); Keigo Osuga MD; Masahisa Nakamura MD; Kentaro Kishimoto; Kaishu Tanaka; Yusuke Ono; Hiroki Higashihara MD; Nortyuki Tomiyama MD, PhD

**PURPOSE**
Cone-beam CT (CBCT) guided targeting system or XperGuide (Philips Medical Systems) is a real-time 3D needle navigation system on live fluoroscopy overlapped with CBCT image as a practical tool. The purpose of this study was to evaluate the accuracy and procedure time of this system compared to conventional CT guidance technique using a phantom model.

**METHOD AND MATERIALS**
A phantom was made of corn flour and clay that contained multiple 1 cm kneaded erasers as targets. The target can be recognized at live fluoroscopy overlapped with CBCT image as a practical tool. The purpose of this study was to evaluate the accuracy and procedure time of this system compared to conventional CT guidance technique using a phantom model. To analyze volume gain of the future liver remnant (FLR) after right portal vein embolization (PVE) in patients who received particle only embolization.

**RESULTS**
All targets were successfully targeted with the first needle pass in all sessions using both techniques by four interventional radiologists. Mean distance from the surface puncture point to the target was 104±13 mm and 101±17 mm (p=0.54), mean gap was 1.88±0.83 and 4.06±1.22 mm (p=0.002).

**CONCLUSION**
CBCT guided targeting system or XperGuide allows more accurate lesion targeting and quicker needle interventions in a phantom model compared to conventional CT guidance.

**CLINICAL RELEVANCE/APPLICATION**
CBCT guided targeting system or XperGuide allows accurate lesion targeting and quick needle interventions. This system will improve needle interventions.

**SSA23-07** • 3T MRI-guided Transperineal Targeted Prostate Biopsy Using a Robotic Needle Guidance Template

Sang-Eun Song; Kemal Tuncali MD; Junichi Tokuda PhD; Andriy Fedorov PhD; Tobias Penzkofer MD *; Clare M Tempany-Afdhal MD; Fiona M Fennessy MD, PhD; Nobuhiko Hata PhD (Presenter) *
Conventional needle guidance templates used in MRI-guided targeted prostate biopsy have limited targeting accuracy, typically 5 mm intervals, and are prone to human error in selecting holes. To overcome such problems, we developed and tested a motorized needle guidance template (Smart Template) that allows automated targeting without restriction in a 3T MRI.

**METHOD AND MATERIALS**

Fifteen men with suspicion of prostate cancer underwent 3T wide-bore MRI-guided transperineal targeted prostate biopsy in the lithotomy position using Smart Template and 3D Slicer navigation software. Target lesions were preoperatively identified on multi-parametric MRI (mpMRI) by three radiologists. The targets were re-identified on intraoperative MRI through registration. The navigation software provided the Smart Template’s guidance position and needle placement depth for each target. Insertion was performed manually and if needed, the guidance position was adjusted to achieve a satisfactory needle placement confirmed by MRI.

**RESULTS**

All procedures were performed successfully without adverse events and tissue samples were collected from targeted lesions in all cases. 2 to 6 targets were selected per patient, and an average of 2.4 ± 0.9 tissue samples were obtained from each target. The mean procedural time was 122 ± 27 min including 55 ± 18 min of in-MRI preparation time, which is similar to that of using a conventional template. 10 of the 47 sampled targets were positive for malignant tissue (21.3%), resulting in prostate cancer diagnosis for 53.3% (N = 8) of the patients.

**CONCLUSION**

Smart Template has been successfully integrated into the procedural workflow of existing MRI-guided transperineal targeted prostate biopsy. The robotic needle guidance demonstrated unrestricted access to any part of the prostate gland volume without noticeable image degradation, complexity or significant prolongation of the procedural time.

**CLINICAL RELEVANCE/APPLICATION**

A robotic needle guidance template has been used for 3T MRI-guided transperineal targeted prostate biopsy to aid needle placement.

**SSA23-08 • Real Time Image Fusion with Contrast Enhanced CT, 18FDG-PET and US in Liver Percutaneous Ablations and Biopsies**

**Giovanni Mauri** MD (Presenter); **Luca Cova** MD; **Tania Tondolo**; **Tiziana Ierace** MD; **Enzo Di Mauro**; **S. Nahum Goldberg** MD *; **Luigi Soldiati** MD

**PURPOSE**

To report our preliminary experience with real time image fusion between contrast enhanced CT, 18FDG-PET and US in liver percutaneous ablations and biopsies.

**METHOD AND MATERIALS**

24 patients with liver lesions detectable only at 18FDG-PET underwent percutaneous ablation (10 patients) or biopsy (14 patients) guided by a novel image fusion system that combines real-time US with fusion to previously acquired and fused contrast enhanced CT and 18FDG-PET images based upon magnetic field tracking and computer reconstruction of the targeting path (Esaote, Genoa, Italy). 18FDG-PET/CT was performed at 24 hours to assess the technical efficacy of thermal ablations (i.e. absence of uptake). Histological results (i.e. adequacy of the sample) was used to assess the result of percutaneous biopsies.

**RESULTS**

In all cases it was possible to obtain correct fusion between contrast enhanced CT, 18FDG-PET and US and to perform the procedure as planned.

At 24 hours 8/10 (80%) treated lesions demonstrated absence of uptake at 18FDG-PET/CT, while two lesions demonstrated partial peripheral uptake, being considered correctly targeted but incompletely ablated. A diagnostic sample was obtained in 12/14 (86%) patients who underwent percutaneous biopsy guided with this technique. No major complications occurred.

**CONCLUSION**

Real time image fusion between contrast enhanced CT, 18FDG-PET and US is feasible and allow for a precise targeting of many tumors detectable only at 18FDG-PET.

**CLINICAL RELEVANCE/APPLICATION**

This method holds the potential for offering ablation and biopsy to additional patient populations.

**SSA23-09 • Development and Clinical Evaluation of a Three-dimensional Ultrasound System for Pre-operative Assessment and Guiding Percutaneous Treatment of Focal Liver Tumors**

**Hamid Reza Sadeghi Neshat** MSc (Presenter); **Derek W Cool** MD, PhD *; **Jeffrey Bax** BENG *; **Kevin Barker**; **Lori Gardi**; **Nirmal Kakani** MD; **Aaron Fenster** PhD *

**CONCLUSION**

Our 3D US system improves capabilities of conventional US by facilitating targeting of lesions identified in other modalities. Ongoing work includes automatic probe tracking and motion compensation.

**Background**

Image-guided percutaneous ablation is a standard treatment for focal liver tumors deemed inoperable and to maintain eligibility for patients on transplant waitlists. Radiofrequency (RFa), microwave (MWA) and cryo-ablation technologies are all delivered via a needle-shaped probe inserted directly into the tumor. Planning is mostly based on contrast CT/MRI. While intra-procedural CT (iCT) is commonly used to confirm the intended probe placement, 2D ultrasound (US) remains the main imaging modality for needle guidance, and in some centers is the only modality used. Correlation of the inoperative 2D US with iCT or pre-operative imaging is essential for accurate needle placement, however, correspondence can be challenging given the limited field-of-view (FOV) in 2D US. We have developed a passive tracking arm with motorized scan-head and software tools to improve guiding capabilities of conventional US by large FOV 3D US scans that can be overlaid and compared to planning and iCT.

**Evaluation**

The developed scanner was tested on phantoms to confirm accuracy of 3D measurements and probe localization as compared to CT. For phase 1 clinical evaluation (IRB approved), a total of 17 tumors (1.0-4.5cm) were treated using 1-3 RFA or MWA probes without re-intervention in 14 cases. Contrast CT prior to ablation (for tumor measurements) and iCT after each probe insertion (for localization measurements) were acquired. Each CT was followed by a 3D US for comparison. 3D US and CT measurements corresponded well with tumor volume, angle and distance between probes differing by 7.7±4.5%, 4.2±3.2° and 2.1±1.3mm respectively.

**Discussion**

Mechanically tracked 3D US provided comparable measurement results to CT in a single scan (3-8 seconds). The main limitation is for US occult tumors. In such cases, fusion of the US with the planning CT can be used to provide an insertion roadmap. 3D US facilitates co-registration by providing more structures visible in both modalities (e.g. vessels, surfaces) and tracker coordinates.
Puncture

SSA24-03 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5
Moderator
Wael E Saad, MBCh *
Moderator
Thomas-Evangelos G Vrachiotis, MD, PhD

SSA24-01 • Portal Vein Thrombosis after Tips with the Viatorr Stent Graft: Imaging Frequency and Correlation with Site of Puncture
Jorge E Lopera MD (Presenter) *; Venkata S Katabathina MD; Martin Goros; Brian T Bosworth MD; Deepak Garg MBBS, MD; Ghazwan M Kroma MD; Andres Garza; Rajeev Suri MD

PURPOSE
To study the incidence of portal vein thrombosis (PVT) after elective Tips using the Viatorr stent graft and determine if there is any potential relationship between the puncture site and development of PVT.

METHOD AND MATERIALS
A retrospective review of medical records of patients that underwent elective Tips with the Viatorr stent graft was performed. Contrast enhanced cross sectional imaging studies, performed within 1 year after Tips were evaluated for PVT. The puncture site for Tips was determined in direct portograms and classified as central or peripheral. Any potential relationship between the puncture site and the presence of PVT was determined.

RESULTS
Elective Tips with the Viatorr was performed in 48 patients (ages 28-70 mean 54). Follow-up imaging demonstrated that the presence of branch PVT was very frequent (38/48, 79%), and affected the right anterior (n=6), right posterior (n=25) or left (n=7) portal veins. There were no main portal vein thromboses. Central punctures in 12 patients were associated with PVT in 9 occasions. More peripheral punctures at the confluence of the right portal branches in 22 patients, or in a more peripheral right branch in 14 patients, were associated with segmental PVT in 17 and 12 patients, respectively. In only in 1 patient there was a technical problem with stent placement. Overall there was no correlation between the puncture site and the presence of PVT (Fisher Exact test p=0.1).

CONCLUSION
Thrombosis of major portal vein branches is a very frequent imaging finding after elective Tips with the Viatorr stent graft. There was no correlation between the puncture site, central or peripheral, and the presence of PVT.

CLINICAL RELEVANCE/APPLICATION
Thrombosis of major portal vein branches is a frequent imaging finding after elective Tips with the Viatorr stent. However, there is no correlation between PVT and the site of puncture.

SSA24-02 • The Outcome of Shunt Reduction after TIPS by the Parallel Technique: A Prospective Study
Bart De Keyzer MD (Presenter); Frederik Nevens MD, PhD; Sam Heye MD; Johan Vaninbroukx MD; Chris Verslype MD, PhD; David Cassiman MD, PhD; Wim Laeeman; Geert Maleux MD, PhD

PURPOSE
Transjugular intrahepatic portosystemic shunt (TIPS) placement became the standard treatment for a subcategory of patients with refractory ascites and variceal bleeding. It has the disadvantage of provoking chronic hepatic encephalopathy (HE) and, in some patients with limited liver function, TIPS-induced liver failure (LF). Reduction of the diameter of the TIPS stent is feasible by the parallel technique. However, the experience is still limited.

METHOD AND MATERIALS
TIPS reduction was performed by the placement of a 10 mm self-expanding stent along with a 5-6-7 mm balloon-expandable stent. After a learning group of 17 patients (Maleux G, JVIR 2007), 55 patients were included in this prospective study. Baseline characteristics included age, gender, cause of cirrhosis, MELD score, indication for TIPS, time interval between TIPS and reduction, and pressure gradient before and after reduction.

RESULTS
Patients with medical therapy resistant chronic HE: improvement of HE = 25/34 (74%), recurrence of initial indication = 9/34 (26%) and six month survival = 29/34 (85%). Patients with TIPS-induced liver failure: improvement 11/21 (52%) and survival 11/21 (52%), three of these patients received a liver transplantation.

CONCLUSION
Stent reductions with the parallel technique improved chronic hepatic encephalopathy in 74% of the patients and offered them a 6 months survival of 85%. In patients who developed TIPS-induced liver failure, 52% recovered and for this group, TIPS reduction can serve as a bridge to liver transplantation.

CLINICAL RELEVANCE/APPLICATION
TIPS-induced hepatic encephalopathy refractory to medical therapy can be improved by shunt reducing techniques in a majority of cases.

SSA24-03 • Hepatic Infarction Following Transjugular Intrahepatic Portosystemic Shunt: An Analysis of Pathogenesis and Clinical Outcomes
Fredrik J Baldin MD (Presenter); Jorge E Lopera MD *; Ryan R Scott MD

PURPOSE
To assess clinical outcomes and examine potential factors leading to hepatic infarction following TIPSS.

METHOD AND MATERIALS
A retrospective review of all patients with follow-up cross sectional imaging after TIPSS was performed. The outcomes of patients with imaging findings suggestive of hepatic infarction were analyzed along with technical, demographic, and clinical data.

RESULTS
Out of 62 total patients with cross-sectional imaging after TIPSS performed between 6/2008 and 4/2012, seven (5 males and two females, average age of 54.7 years old (range 44-66)) were identified with imaging (6 CT, 1MRI) suggestive of hepatic infarction. All patients received PTFE stent-grafts. Average pre-TIPSS MELD score was 13.2 (range 6-20) and average post-TIPSS MELD score was 21.2 (range 9-38). Four patients developed worsening liver failure, of which two died early and two received liver transplants. One died of complications related to recurrent upper GI bleeding, one survived with intermittent hepatic encephalopathy, and one patient was lost to follow-up shortly after the procedure. Follow-up imaging revealed 5 patients had thrombosis of right portal vein branches and two had right hepatic vein thrombosis.

CONCLUSION
Hepatic infarction following TIPSS is a rare complication with high a mortality rate that may be associated with right portal vein and/or hepatic vein thrombosis.

CLINICAL RELEVANCE/APPLICATION
Currently there are only case studies of hepatic infarction after TIPSS. This case series aims to examine causes of this potentially fatal complication while analyzing the outcomes in 7 patients.
Invasion

SSA24-07 • Sclerosants

This comparative study supports safer properties of foam.

CLINICAL RELEVANCE/APPLICATION
Foam polidocanol provided less invasive BRTO than liquid ethanolamine oleate with comparative clinical success.

CONCLUSION
Complete stasis of the gastric varices was obtained in all patients of both groups. Abdominal symptoms during BRTO were significantly reduced and complication rates were compared among the two groups.

RESULTS
Forty-three patients with gastric varices were performed BRTO since October 2001. Of these, three patients were excluded because of refractory to medical management.

PURPOSE
This study shows that BRTO may be offered as an alternative treatment to patients having recurrent portal systemic encephalopathy refractory to medical management.

CLINICAL RELEVANCE/APPLICATION
Our experience suggests portal systemic hepatic encephalopathy refractory to medical management can be effectively treated by BRTO.

SSA24-05 • Treating Portal Systemic Encephalopathy with Balloon-occluded Retrograde Transvenous Obliteration (BRTO) - A Road Less Travelled

Amar Mukund (Presenter); S. Rajesh MBBS, MD; Ankur Arora MD, FRCP; Shiv Sarin

PURPOSE
To evaluate the efficacy of BRTO using foam sclerotherapy in managing symptoms arising due to spontaneous large porto-systemic shunts.

METHOD AND MATERIALS
20 sessions of BRTO was performed in 18 patients using sodium tetradecyl sulphate foam. All patients had cirrhosis along with history of recurrent hepatic encephalopathy requiring hospital admission. Porto-systemic communication in the form of gastro/lienocardiac shunt was present in all cases and seen on pre procedure computed tomography scans. Clinical and lab parameters including arterial ammonia level were evaluated before and after the procedure in all patients.

RESULTS
Technical success was achieved in 18 of 20 sessions (90%). Complete obliteration of varices was seen in 15 of 18 patients (83%) and partial obliteration in remaining 3, on follow up imaging. Immediate clinical improvement of hepatic encephalopathy was observed in 16 of 18 patients (89%) with post procedure decrease in serum ammonia levels, two patients had delayed improvement. Post-procedure complication consisting either of ascites, septicemia with acute kidney injury or deranged liver function tests was encountered in 5 patients. All the patients were clinically and symptomatically better on discharge and up to a follow up of 18 months (one month and thereafter 3, 6, 12, 18 months).

CONCLUSION
Our experience suggests portal systemic hepatic encephalopathy refractory to medical management can be effectively treated by BRTO.

SSA24-06 • The Comparison of Balloon-occluded Retrograde Transvenous Obliteration for Gastric Varices Using Liquid and Foam Sclerosants

Jun Koizumi MD, PhD (Presenter); Tatsuya Sekiguchi; Tamaki Ichikawa MD; Chihiro Itou; Takuya Hara MD; Bertrand Janne d’Othee MD, MPH

PURPOSE
Liquid ethanolamine oleate which has been used traditionally for balloon-occluded retrograde transvenous obliteration (BROTO) of the gastric varices (GV) may cause severe complications including hemolysis, allergy, etc. if overdosed. Thus, we introduced foam sclerotherapy to reduce the dose and compared the safety and efficacy of BROTO using liquid and foam sclerosants.

METHOD AND MATERIALS
Forty-three patients with gastric varices were performed BROTO since October 2001. Of these, three patients were excluded because simultaneous TACE or PSE was performed. Twenty patients using liquid ethanolamine oleate with iodine contrast (EOI, Fig.1) before March 2005 and twenty patients using polidocanol foam (POF, Fig.2) after May 2005 were included in this study. The success rates, side effects and complication rates were compared among the two groups.

RESULTS
Complete stasis of the gastric varices was obtained in all patients of both groups. Abdominal symptoms during BROTO were significantly reduced (p<0.05) and was also significantly (p<0.05) compared to the previous treatment.

CONCLUSION
Foam polidocanol provided less invasive BROTO than liquid ethanolamine oleate with comparative clinical success.

CLINICAL RELEVANCE/APPLICATION
EOI which is traditionally used in BROTO may cause hemolysis and require haptoglobin. In the U.S. EOI is now replaced by foam sclerosant. This comparative study supports safer properties of foam.
To evaluate clinical outcomes of portal venous stent placement in patients with symptomatic portal hypertension caused by malignant tumor invasion.

METHOD AND MATERIALS
From July 2005 to January 2013, eleven patients with portal venous stenosis or occlusion caused by bile duct cancer (n=6), pancreatic cancer (n=4), and nodal metastasis from colon cancer (n=1) underwent stent placement because of gastrointestinal bleeding (n=4), ascites (n=4), liver dysfunction (n=2), and hypersplenism (n=1). Stents were placed across the stenotic (n=7) or occluded (n=4) lesions after percutaneous transhepatic portography. Technical success, changes in portal venous pressure, symptoms, complications, stent patency, and survival were evaluated. Complications were evaluated by using Common Terminology Criteria for Adverse Events (CTCAE).

RESULTS
Stent placement was technically successful in all patients (technical success rate: 100%, 11/11). The mean portal venous pressure gradient decreased from 12.6±4.8 mmHg (range, 5-20 mmHg) to 0.5±1.0 mmHg (range, 0-3 mmHg) (p<0.05). Portal venous stent placement is feasible, safe, and effective technique to relieve symptomatic portal hypertension caused by malignant tumor invasion.

CONCLUSION
Portal venous stent placement is an effective treatment option for patients with portal hypertension caused by malignant tumor invasion.

SSA24-08 • Metallic Stent Placement for the Treatment of Hepatic Venous Outflow Block after Living-Donor-Liver Transplantation

Masashi Fujimori MD (Presenter) ; Shugo Mizuno ; Atsuhiro Nakatsuka MD ; Haruyuki Takaki MD ; Junji Uraki MD ; Takashi Yamanaka MD ; Takaaki Hasegawa ; Hajime Sakuma MD * ; Shuji Isaji ; Koichiro Yamakado MD, PhD

PURPOSE
To retrospectively evaluate the clinical efficacy of metallic stent placement for the treatment of hepatic venous outflow block after living-donor-liver transplantation (LDLT).

METHOD AND MATERIALS
This study was approved by our institutional review board, which waived the requirement for informed consent to use data for research purposes. From 2002 to 2012, 15 patients with a mean age of 51±30.8 years (range, 4-69 years) underwent stent placement for the treatment of outflow block 1-341 days after LDLT with a mean interval of 24±54.7 days. Venous stenosis with a pressure gradient of 10mmHg or more was found in the inferior vena cava in 7 patients, hepatic vein in 7 patients, and in both in 1 patient. Stents were percutaneously placed across stenosis. Technical success (pressure gradient<3mmHg), complication, improvement in clinical manifestation, stent patency, and survival were evaluated.

RESULTS
Technical success was achieved in all 15 patients (100%, 15/15). There was no death or major complications related to stent placement. The mean pressure gradient significantly decreased from 13±8mmHg (range, 10-24 mmHg) to 0.8±2mmHg (range, 0-2 mmHg) (p<0.05). Stenting is a safe and useful treatment to resolve outflow block after LDLT and helps to improve prognosis of such patients.

CONCLUSION
Metallic stent placement is a safe and useful treatment to resolve hepatic venous outflow block after LDLT and helps to improve prognosis of such patients.

SSA24-09 • Optimal Protocol of Scanning Mode in the Portal Vein Angiography with a Low-Concentration Contrast Medium

Yan Liang MMed ; Zhiren Chen MD (Presenter) ; Dongbin Shi ; Yan Wang ; Bin Li ; Huizhi Cao ; Ying Tong

PURPOSE
To explore the optimal protocol of CT scanning mode in the portal vein angiography with a low-concentration contrast medium.

METHOD AND MATERIALS
63 patients underwent enhanced urinary CT scan All the patients were divided into 3 groups according to different body mass index(BMI). 21 patients of group A(BMI=22) received 80-100kVp CT scan, automatic exposure control (3D Auto mA) and pitch of 0.984. All the images were reconstructed with adaptive statistical iterative reconstruction algorithm. 14 patients of group B (BMI=26) received single-source dual-energy spectral CT (sDECT) scan at the pitch of 1.375. Monochromatic images was reconstructed and optimal keV with best contrast-to-noise(CNR) was calculated. Another 28 patients of group C with routine 120Kp CT scan. Low concentration of iodixanol(270mg I/ml) was used in group A and B, and high concentration of iopamidol(370 mg I/ml) was adopted in group C. 70 ml of total amount of contrast was injected at 2.7ml/s. ROIs were placed on abdominal aorta, renal artery, superior mesenteric artery and portal vein. Signal-to-noise ratio (SNR) and CNR was calculated.

RESULTS
In low-kVP Group, the CNR and SNR were (8.12±3.09) and (14.72±4.05) for trunk of portal vein, (6.59±2.13) and (13.40±4.68) for its left branch, and (7.24±2.19) and (13.56±4.99) for its right branch respectively. In sDECT Group, the CNR and SNR were (8.68±2.69) and (13.38±3.06) for trunk of portal vein, (9.31±2.88) and (13.58±3.21) for left branch, and (9.53±2.66) and (13.72±3.03) for its right branch respectively. In low-kVP group, the CNR and SNR were (6.68±3.41) and (13.13±4.36) for trunk of portal vein, (6.22±1.98) and (12.73±4.11) for its left branch, and (7.09±2.04) and (12.35±4.36) for its right branch respectively. The image quality was slightly higher in sDECT Group than routine 120kVP Group and low-kVP Group, but no significantly different was found in among three groups (P>0.05). Compared with that in 120kVP Group (7.23±1.53mGy), the radiation dose index was significantly lower in low-kVP Group (4.75±1.39 mGy) (P<0.05). With a low-concentration contrast medium, the low-kVP and sDECT scanning mode is rationaly via BMI without sacrificing image quality.

CONCLUSION
With low kVP and spectral CT imaging of low iodine concentration or 120kVP of moderate iodine concentration, higher intravascular enhancement can be achieved with good vessel display.
This study helps support validation of MRI PDFF as a non-invasive biomarker for hepatic steatosis by showing high accuracy in a large

**SUMMARY**

Major teaching points: 1) Postprocedure CT and MR should report absence of intratumor enhancement and findings supporting the presence of tumoral necrosis. 2) Nonenhancing lesions after TACE without findings supporting tumoral necrosis warrant close attention on follow-up imaging. 3) Hepatic complications of TACE include nontarget embolization, hepatic abscess, biloma, liver infarct and hepatic failure.

**LL-GIE-SU11A • Complicated and Uncomplicated Meckel's Diverticulum: Spectrum of CT Appearance**

**Satomi Kawamoto** MD (Presenter) *; **Siva P Raman** MD; **Ralph H Hruban** *; **Elliot K Fishman** MD *

**PURPOSE/AIM**

1. Meckel's diverticulum is estimated to occur in approximately 2% of the population. Complications of Meckel's diverticulum are well known, but difficult to diagnose preoperatively. 2. To review embryology and clinical presentation of Meckel's diverticulum 3. To review and illustrate uncomplicated and complicated Meckel's diverticulum on CT, and discuss the radiologic evaluation of suspected Meckel's diverticulum

**CONTENT ORGANIZATION**

1. Review embryology of Meckel's diverticulum 2. Clinical presentation and work-up of complication of Meckel's diverticulum 3. CT appearance of Meckel's diverticulum in pediatric and adult population

- Incidentally seen normal Meckel's diverticulum
- Ectopic gastric mucosa and bleeding
- Small bowel obstruction
- Inverted Meckel's diverticulum
- Neoplasm associated with Meckel's diverticulum

4. CT technique which may influence visualization of Meckel's diverticulum 5. Role of CT and other radiological studies for diagnosis of complicated Meckel's diverticulum

**SUMMARY**

Meckel's diverticulum may be visualized on CT as a blind-ending outpouching of variable size. CT is helpful for diagnosis of associated complications, most commonly hemorrhage from peptic ulceration, small bowel obstruction and diverticulitis.

**LL-GIE-SU12A • MR Imaging of Perianal Fistulas: Beyond the St. James Classification**

**Ryan O'Malley** MD (Presenter); **Neil Hansen** MD; **Zachary W Washburn** MD; **Mahmoud M Al-Hawary** MD; **Peter S Liu** MD; **Hero K Hussain** MD *

**PURPOSE/AIM**

Discuss unique etiologies of complex perianal fistulas that are frequently encountered in practice, but do not fit within the St. James classification. Demonstrate the MRI findings and discuss its unique advantages for depicting these complex fistulas. Discuss how accurate characterization affects management.

**CONTENT ORGANIZATION**

Brief review of anorectal anatomy, St. James classification, and MR findings in perianal fistulas. Discuss specific entities that are prone to complex fistulizing disease and how they do not follow St. James classification scheme:

- Long-standing inflammatory bowel disease with tracts that can involve any (and often multiple) adjacent structures
- Fistulas arising from anorectal neoplasms (including lesions presenting solely as fistulizing disease)
- Fistulas arising at the site of prior anorectal surgical or radiation therapy

Sample cases with specific attention to how accurate diagnosis and characterization impacts patient management and quality of life.

**SUMMARY**

MRI is uniquely valuable for assessing complex perianal fistulas that do not fit into traditional classification schemes and can be clinically underestimated. As such, radiologists must be aware of and accurately characterize these entities, which often have a profound impact on patient management and quality of life.

**LL-GIS-SU1A • Correlation between MRI- and MRS-estimated Proton Density Fat Fraction (PDFF) in 506 Adult Subjects with Non-alcoholic Fatty Liver Disease (NAFLD)**

**Elhamy R Heba** MBCh (Presenter); **Ajinkya S Desai** MBBS; **Tanya Wolfson** MS; **Tanya Chavez**; **Kevin A Zand** MD; **Jessica Lam** BS; **Jonathan C Hooker** BS; **Lisa Clark** MPH, PhD; **Rohit Loomba** MD, MSc; **Anthony Gamst** PhD; **Claude B Sirlin** MD *; **Michael S Middleton** MD, PhD *

**PURPOSE**

To evaluate MRI proton density fat fraction (PDFF) accuracy in quantifying hepatic steatosis using MRS PDFF as reference in a cohort of 506 adult subjects with known or suspected non-alcoholic fatty liver disease (NAFLD).

**METHOD AND MATERIALS**

**RESULTS**

506 adult subjects were enrolled in this study. Regression analysis showed close agreement between MRI PDFF and MRS PDFF with intercept = 0.599%, slope = 1.006, and R² = 0.979 (p < 0.001; see Figure). There was agreement between MRI and MRS PDFF for subjects with either MRI or MRS PDFF less than 10%, with intercept = 0.401, slope = 1.036, and R² = 0.838 (p < 0.001).

**HISTOLOGY**

Histology-determined fibrosis grade did not show a significant effect on MRI PDFF estimation in the subset of 72/506 subjects who had liver biopsy.

**CONCLUSION**

MRI accurately quantifies hepatic PDFF in adults with known or suspected NAFLD. To our knowledge, this is the largest study to date evaluating MRI PDFF accuracy to assess hepatic steatosis.

**CLINICAL RELEVANCE/APPLICATION**

This study helps support validation of MRI PDFF as a non-invasive biomarker for hepatic steatosis by showing high accuracy in a large
Patients after Resection

CONCLUSION
The results of this study demonstrated gadoxetic acid-enhanced MR imaging provided higher detectability for hepatic metastases, especially in smaller size of lesion, compared with contrast-enhanced CT in patients with colorectal carcinoma.

CLINICAL RELEVANCE/APPLICATION
Gadoxetic acid-enhanced MR imaging can detect smaller size of hepatic metastases compared with CT and would provide more feasible therapeutic direction for patients with colorectal carcinoma.

LL-GIS-SU3A • Radiation Dose Reduction from a Newly Proposed Surveillance CT Scan Protocol for Hepatocellular Carcinoma Patients after Resection

Dan Liu

PURPOSE
The purpose of our study was to develop a recurrence risk classification rule for postoperative Hepatocellular Carcinoma (HCC) patients and to propose an appropriate protocol for surveillance CT scans.

METHOD AND MATERIALS
Institutional board approval was obtained for this retrospective study. We identified all consecutive HCC patients who had initial resection surgery at our institution from 8/2003 to 12/2009 and evaluated the postoperative surveillance CT scans for positive or negative findings of recurrent disease. Volume CT dose index (CTDivo1), dose length product (DLP), and effective diameter (ED) and size-specific dose estimates (SSDE) were computed. Patient age at surgery and known tumor risk factors including cirrhosis, tumor size (=5cm), presence of portal or hepatic vein involvement, solitary vs multiple, presence of vascular invasion, cell differentiation and pathologic T stage were recorded. Multivariable Cox regression analysis was performed to identify risk factors, and then those factors were analyzed by Classification and Regression Tree analysis. P

RESULTS
There were 2776 postoperative surveillance CT studies performed on 258 patients (206 male/ 52 female, 29- 82 years old (56.5±21.8) over a follow up period of 52.8 (±57.2) months. The mean number of surveillance CT studies per patient, DLP, CTDivo1, ED and SSDE of an individual CT were 11 (+9.9), 1627.8 (+892.3) mGy.cm , 89.6 (+42.6) mGy , 26.0 (+5.2) cm, and 128.9 (+52.1) mGy, respectively. The new classification rule identified three risk groups of HCC recurrence. Based on these findings, extending the interval of surveillance CT scans from the current 6 monthly to 9 monthly from 2 years post-surgery will not reduce or delay the detection rate of HCC recurrence for low-risk group. This translates to a dose savings of 14.29% for a five year follow protocol.

CONCLUSION
Computed Tomography used in HCC surveillance protocol imparts significant radiation doses. Low recurrence risk patients for whom extending the CT scan interval for surveillance will reduce radiation detriment without compromising surveillance benefits.

CLINICAL RELEVANCE/APPLICATION
The newly proposed surveillance CT scan protocol for postoperative Hepatocellular carcinoma patients will reduce radiation detriment without compromising surveillance benefits.

LL-GIS-SU4A • Noninvasive Assessment of Hepatic Fibrosis by Liver Stiffness Measurement: Comparison of MR Elastography and Ultrasound Transient Elastography

Shintaro Ichikawa

PURPOSE
The study included 113 patients who underwent liver biopsy or surgery, UTE, and MRE. The histological fibrosis score was F0 in 15 patients, F1 in 12, F2 in 19, F3 in 24, and F4 in 43. MR imaging was performed using a 1.5T or 3T (Signa EXCITE HD and Discovery 750; GE Healthcare). UTE was performed using Fibroscan (Echosens) by a gastroenterologist. Receiver operating characteristic curve analysis was performed to determine the optimal cutoff value and accuracy of MRE and UTE for staging of hepatic fibrosis.

RESULTS
The mean stiffness values of the liver increased with an increase in the fibrosis stage (MRE: F0, 2.03 ± 0.22 kPa; F1, 2.37 ± 0.33 kPa; F2, 2.92 ± 0.39 kPa; F3, 4.11 ± 0.76 kPa; and F4, 6.34 ± 1.68 kPa and UTE: F0, 5.95 ± 2.34 kPa; F1, 6.93 ± 2.02 kPa; F2, 7.47 ± 3.44 kPa; F3, 11.1 ± 5.99 kPa; F4, 27.1 ± 15.8 kPa). There was a significant correlation between histological fibrosis score and the liver stiffness determined using MRE (r = 0.9166, p < 0.0001) and UTE (r = 0.8100, p < 0.0001). The AZ values for diagnosing each fibrosis score were as follows (MRE vs. UTE): =F1, 0.97 [0.92-0.99] vs. 0.87 [0.76-0.93] (p = 0.0126); =F2, 0.98 [0.94-0.99] vs. 0.87 [0.79-0.92] (p = 0.0003); =F3, 0.99 [0.96-0.99] vs. 0.96 [0.91-0.98] (p = 0.0526); =F4, 0.97 [0.93-0.99] vs. 0.91 [0.87-0.95] (p = 0.0308). The optimal cutoff values were as follows: =F1, 2.5 kPa; =F2, 2.7 kPa; =F3, 3.5 kPa; =F4, 4.3 kPa with MRE and =F1, 6.9 kPa; =F2, 9.9 kPa; =F3, 10.1 kPa; =F4, 13.9 kPa with UTE. The predicted sensitivity and specificity of differentiating fibrosis score with these cutoff values were as follows: =F1, 88/98 (89.8%) and 15/15 (100%); =F2, 81/86 (94.2%) and 26/27 (96.3%); =F3, 56/62 (90.3%) and 50/51 (98.0%); =F4, 40/43 (93.0%) and 61/71 (87.1%) with MRE and =F1, 78/98 (80.0%) and 13/15 (86.7%); =F2, 59/86 (68.6%) and 25/27 (92.6%); =F3, 56/62 (90.3%) and 47/51 (92.2%); =F4, 39/43 (90.7%) and 60/70 (85.7%) with UTE.

CONCLUSION
The purpose of this study was to retrospectively evaluate diagnostic efficacy of gadoxetic acid-enhanced magnetic resonance (MR) imaging compared with contrast-enhanced CT in the detection of hepatic metastasis in patients with colorectal carcinoma.
CONCLUSION
The efficacy of MRE is better than that of UTE for diagnosing hepatic fibrosis.

CLINICAL RELEVANCE/APPLICATION
There is only 1 previous report of a direct comparison of MRE and UTE. MRE in our study was performed using a different protocol, but our results were similar to those of the previous report.

**LL-GIS-SU7A ● Reducing Radiation Dose at CT Colonography: The Size-dependent Effect of Iterative Reconstruction on Reduced kV Imaging**

**Kevin J Chang** MD (Presenter) ; **Michael A Heisler** MD ; **Walter Huda** PhD * ; **Grayson L Baird** MS ; **William W Mayo-Smith** MD *

**PURPOSE**
Reducing kVp in CT colonography (CTC) without iterative reconstruction has been shown to decrease radiation dose at all patient sizes at a cost of increased image noise. The purpose of this study was to show the effect of patient size on radiation dose in exams using iterative reconstruction.

**METHOD AND MATERIALS**
This retrospective study included 113 patients undergoing CTC. Each patient underwent a supine scan at 120 kVp and a prone scan at 100 kVp. All other scan parameters including automatic dose modulation (noise index) were unchanged. 63 patients had the exam performed without adaptive statistical iteration (ASIIR) and 50 patients had 30% ASIIR in the protocol. CT Dose Index (CTDIvol), Dose Length Product (DLP), and patient size (AP diameter at the level of the right renal hilum) were recorded at both 120 and 100 kVp. A general linear model with a logarithmic transform was used to compare CTDIvol and DLP versus patient size and kVp prior to and following incorporation of ASIIR.

**RESULTS**
Scans with ASIIR had significantly lower CTDIvol and DLP relative to scans without ASIIR. As size increased, CTDIvol and DLP also increased non-linearly, regardless of ASIIR and kVp (all p < 0.00001). The relationship between dose reduction and patient size in CTC exams using ASIIR is complicated. Larger patients (over 26 cm) appear to have decreased dose reduction benefits from lower kVp exams when ASIIR is employed.

**CLINICAL RELEVANCE/APPLICATION**
While kVp reduction is a viable option to decrease radiation dose, dose savings may not be realized when combined with iterative reconstruction in larger patients.

**LL-GIS-SU6A ● Added Value of Morphologic Characteristics in Diffusion Weighted Imaging for Evaluating Lymph Nodes in Primary Rectal Cancer**

**Een Young Cho** MD (Presenter) ; **Seung Ho Kim** MD ; **Jung Hee Yoon** MD ; **Yun-Jung Lim** ; **Yedaun Lee** MD ; **Choong K Eun** MD

**PURPOSE**
To identify the morphologic features of metastatic and non-metastatic lymph nodes (LNs) on diffusion-weighted imaging (DWI) and to evaluate the added value of the morphologic features for evaluating LNs in patients with primary rectal cancer.

**METHOD AND MATERIALS**
Institutional review board approved this retrospective study and waived informed consent. Forty-four consecutive patients (17 men, 27 women; mean age: 63 years, range: 37-82 years) with primary rectal cancer who underwent surgery, were enrolled in this study. All patients underwent 1.5-T rectal MRI with DWI (b=0, 1000). To identify morphologic features on DWI, two blinded radiologists in consensus categorized each LN into the several groups according to the imaging characteristics (border, shape and signal intensity). By Fisher's exact test, the morphologic features were determined. To evaluate the added value of the morphologic features for evaluating LNs, other two blinded radiologists independently interpreted the T2WI first and the combined image set of T2WI with DWI on a per-LN basis for the same study population with a four-week interval. The diagnostic predictive values were compared between the two reading sessions for each reader by using McNemar test. Pathology reports served as the reference standard.

**RESULTS**
226 LNs (54 metastatic and 172 non-metastatic LNs) were radiologic-pathologically matched and analyzed. Metastatic LNs showed amorphous subtle high or lobulating heterogeneous signal intensity (SI), whereas non-metastatic LNs showed dense bright dot on DWI (p=0.000001). The specificity and accuracy for metastatic LNs increased after adding DWI for both readers (specificity, from 59% to 73% for reader 1, from 41% to 68% for reader 2; accuracy, from 58% to 68% for reader 1, from 45% to 64% for reader 2, p < 0.0001).

**CONCLUSION**
Metastatic LNs showed amorphous subtle high or lobulating heterogeneous SI on DWI. These additional morphologic characteristics provided better diagnostic specificity and accuracy than T2WI alone did for evaluating LNs in primary rectal cancer.

**CLINICAL RELEVANCE/APPLICATION**
Metastatic LNs show different morphologic features from non-metastatic LNs on DWI. These additional morphologic characteristics can be useful for evaluating LNs in primary rectal cancer.

**LL-GIS-SU7A ● Reproducibility of mRECIST and Volumetric Quantification of Viable Tissue in HCC Lesions**

**Fernanda D Gonzalez Guindalini** MD * ; **Marcos P Botelho** MD * ; **Keyur Parekh** MD (Presenter) * ; **Adeel R Seyed** MD * ; **Hamid Chalian** MD ; **Vahid Yaghmai** MD

**PURPOSE**
To compare the reproducibility of mRECIST and volumetric quantification of viable tissue within HCC lesions after locoregional therapy.

**METHOD AND MATERIALS**
This HIPAA compliant retrospective study was IRB approved. Fifty-eight patients with known diagnosis of HCC treated with 90Y radioembolization and follow-up MDCT study after the treatment were included. Two independent radiologists measured the viable tissue within the lesion, defined as arterially enhancing component, using both mRECIST and volumetric quantification, assessed manually and with semi-automated segmentation software, respectively. Paired t-test, Lin's concordance correlation coefficient (rc), and precision were used to assess intra- and interobserver reproducibility.

**RESULTS**
Fifty-eight HCC lesions in 58 patients, 43 males (74.1%) and 15 females (25.9%), were evaluated. The mean age was 67.1±11.8 years. Intraobserver comparison showed comparable volumetric measurements of the viable tissue (P=0.744) while mRECIST measurements, were significantly different (P=0.025). Concordance correlation coefficient was excellent for volumetry (rc=0.999) and moderate for mRECIST (rc=0.953) with higher precision of 22.8% for volumetry in comparison with 32.0% for mRECIST. Interobserver comparison showed comparable measurements for mRECIST (P=0.306) and volumetry (P=0.463) but concordance correlation coefficient for volumetric measurement of the viable tissue was excellent (rc=0.999) while it was moderate for mRECIST (rc=0.918). Volumetric measurement also had better precision (12.0%) compared to mRECIST (35.5%).

**CONCLUSION**
Volumetric quantification of the viable tissue in HCC lesions demonstrated better inter- and intraobserver correlation as well as precision
in comparison with mRECIST.

**CLINICAL RELEVANCE/APPLICATION**

Necrosis in treated HCC can have heterogeneous distribution. Volumetric quantification of viable tissue demonstrated better agreement between readers than mRECIST.

**LL-GIE-SU8A • Hard to Swallow: Dysphagia, Odynophagia, and the Esophagram in the Emergency Department**

Karl C Schlobohm MD (Presenter); Daniel D Tarver MD; Dmitriy G Akselrod MD; Brendan M Banyon MD; Robert D'Agostino MD

**PURPOSE/AIM**

1. Recognize the imaging characteristics and differential diagnosis of common and uncommon causes of dysphagia and odynophagia in the ER population. 2. Understand the importance of clinical history and review indications and techniques for esophagrams in these patients.

**CONTENT ORGANIZATION**

Special consideration should be given to patients with acute swallowing difficulties. The varying causes of dysphagia and odynophagia make the clinical history and choice of imaging technique important in making accurate diagnoses and aiding in patient management. Cases will be drawn from the Emergency Room at the University of Vermont/Fletcher Allen Health Care. All patients presented with a chief complaint of difficult or painful swallowing. Using a quiz format, clinical history, techniques for esophagram, imaging findings, differential diagnosis and final diagnosis will be presented. Diagnoses will be supported by radiographic, endoscopic, and pathologic images. Cases presented will include candidiasis, pill esophagitis, food impaction, foreign body, radiation stricture, giant peptic ulcer, eosinophilic esophagitis, complication of gastric banding, along with others. Important information to relay to the emergency department will conclude each case.

**SUMMARY**

Cases will be presented where an esophagram used for accurate rapid diagnosis, assisting in effective management.

**LL-GIE-SU9A • Radiological Imaging Workup of the Patient Prior to Small Bowel and Multi-visceral Transplantation**

Nikhil B Amesur MD (Presenter); Anil K Dasyam MD; Amir Borhani MD; Albert B Zajko MD; Kareem Abu-Elmagd MD, PhD; Guilherme Costa MD

**PURPOSE/AIM**

To review the types of visceral transplantation and the radiological workup of the potential recipient prior to the transplantation.

**CONTENT ORGANIZATION**

Introduction: Types of intestinal transplantation:
- Isolated intestinal transplantation
- Combined liver and intestinal transplantation
- Modified multi-visceral transplantation (stomach, duodenum, pancreas and intestine)
- Full multi-visceral transplantation (stomach, duodenum, pancreas, intestine and liver)

Review the role of non-invasive radiological imaging required in these patients particularly to assess the gastrointestinal anatomy, abdominal vasculature and the status of liver using
- Abdominal/Pelvic CT scan or MRI
- UGI/SBFT and contrast enema

Review the more invasive imaging required in these patients including:
A Visceral arteriograms:
- Splenic and superior mesenteric arterial and portal venous studies
B Central venograms:
- utilized for intraoperative supra and infra-diaphragmatic venous access planning
- use of CO2 to decrease iodinated contrast load
C Transjugular liver biopsy - to ensure if a liver transplant is also needed

**SUMMARY**

To enlighten the target audience on the exhaustive radiological imaging requirements in the potential small bowel or multi-visceral transplant recipient.
SUMMARY
The radiologist can make crucial contributions in the evaluation of dysphagia, esophageal motility, and a wide variety of pathologies including functional or structural abnormalities of the oral cavity, pharynx, esophagus, and gastric cardia exist which may cause dysphagia. The conventional pharyngooesophagogram remains the gold standard investigation for precise assessment of these pathologies.

LL-GIE-SU11B • Appendiceal Cancer: An Update on Pathology, Imaging, and Therapy
Tara L Sagebiel MD (Presenter); Priya R Bhosale MD; Keith F Fournier MD; Melissa W Taggart MD; Aurelio Matamoros MD

PURPOSE/AIM
◆ Review the epidemiology and clinical presentations of appendiceal cancers ◆ Explain how appendiceal cancer pathologic subtypes are related to differences in tumor spread, prognosis and treatment ◆ Review the indications for cytoreductive surgery (CRS) and heated intraperitoneal chemotherapy (HIPEC) and the associated radiologic evaluation ◆ Discuss common complications after CRS and HIPEC

CONTENT ORGANIZATION
◆ Epidemiology ◆ Clinical presentation
  1. Appendicitis
  2. Adnexal mass
  3. Incidentaloma
◆ Pathology
  1. Carcinoid
  2. Adenocarcinoid
  3. Adenocarcinoma
  ◆ Mucinous
  ◆ Non-mucinous
◆ Tumor Staging and Prognosis ◆ Selection Criteria for CRS and HIPEC ◆ Common Complications following CRS and HIPEC

SUMMARY
Appendiceal cancer is rare with a variable clinical course that is secondary to differences in the pathologic subtypes. This exhibit reviews the differences in tumor spread, clinical presentation, treatment and prognosis based on appendiceal tumor pathology. Imaging’s role in preoperative staging and its limitations will be discussed, along with the imaging findings of common complications seen after therapy.

LL-GIE-SU12B • Oh Baby! MR Imaging of Suspected Acute Appendicitis in Pregnancy
Kelly A MacLean MD (Presenter); Roshni Patel MBBS, MRCS; Silvia D Chang MD; Alison C Harris MBChB

PURPOSE/AIM
This educational exhibit will review the technique, imaging findings, and common mimickers encountered when performing MRI in the workup of suspected acute appendicitis in pregnancy.

CONTENT ORGANIZATION
With respect to the use of MRI in the workup of suspected acute appendicitis in pregnancy, we will: 1) Provide a brief overview of safety considerations and clinical indications. 2) Review the MR imaging protocols performed at our institution. 3) Review the normal MR imaging appearance of the appendix. 4) Review the MR imaging findings of acute appendicitis, including increased appendiceal diameter, thickened appendiceal wall, periappendiceal inflammatory changes, and periappendiceal phlegmon/abscess formation. 5) Present the MR findings of common mimickers of acute appendicitis, including ovarian torsion, fibroid degeneration, and dermoid cysts.

SUMMARY
The evaluation of acute abdominal and pelvic pain in pregnant patients often poses a diagnostic challenge. Although ultrasound is considered first-line in the evaluation of such patients, MR is a valuable second-line tool in the investigation of pregnant patients with sonographically indeterminate findings.

LL-GIS-SU1B • Indeterminate Cystic-like Lesions at Liver Ultrasound: Additional Value of Microbubbles Injection
Orlando Catalano; Antonio Nunziata MD (Presenter); Sergio Venanzio Setola MD; Fabio Sandomenico MD; Antonella Petrohil MD

PURPOSE
◆ Dirty cystic focal liver lesions (FLLs) at US scanning represent a challenge, since true cysts may mimic a solid FLL as well as a solid FLL may be confused as a cyst. Our single-center prospective study analyzes the additional value of microbubble contrast medium injection in cancer patients with dirty cysts at baseline US.

METHOD AND MATERIALS
January 2006 to December 2012 we identified 48 patients with 50 dirty liver cysts (slightly hypoechoic content in 24 lesions, lack of posterior enhancement in 10 lesions, both findings in 16 lesions) at US scanning. These 48 subjects were imaged for cancer staging or follow-up and had no previous liver study for comparison. They underwent real-time contrast-enhanced ultrasound (CEUS) after the injection of a sulphur hexafluoride-based contrast medium. Diagnosis was confirmed by further imaging in 30 lesions, follow-up in 18, and biopsy in 2.

RESULTS
US was indeterminate by definition in all 50 FLLs (9-39 mm, mean 20). The liver echotexture was fatty in 37 patients and normal in the remaining 11 patients. The inhomogeneous content at US was more predictive of a solid nature than did the lack of a dorsal enhancement. CEUS correctly diagnosed all 24 true cysts (100%) in 24 patients and 25/26 solid lesions (96%) in the remaining 24 patients. Among these 25 solid FLLs there were 18 metastases and 7 hemangiomas, all receiving a definitive, confirmed diagnosis by CEUS. One deeply located metastasis was incorrectly diagnosed as cyst by CEUS.

CONCLUSION
CEUS allows achieving a definitive diagnosis in patients with a nonspecific US finding of dirty liver cyst, allowing at the same time to rule out a solid FLL and to characterize the truly solid lesions.

CLINICAL RELEVANCE/APPLICATION
CEUS allows obtaining a correct diagnosis in patients with nonspecific findings of dirty cysts at US. This is of value in countries where US is regarded as the first choice modality for liver survey.
PURPOSE
Our purpose was to define the cholangiographic patterns of ischemic cholangiopathy (IC) and clinically silent non-anastomotic biliary strictures in donation after cardiac death (DCD) liver grafts in a large single institution series. We also examined the correlation of the radiologic findings with laboratory data and clinical outcomes.

METHOD AND MATERIALS
Data were collected for all DCD liver transplant recipients at our institution from December 1998 to October 2010. Post-transplant cholangiograms were performed on days 3 and 21, and also when clinically indicated. Intrahepatic biliary strictures were classified by anatomic distribution and chronologic development. Radiologic findings were correlated with laboratory data and with 1, 3, and 5 year grafts and with patient survival.

RESULTS
There were a total of 216 patients with DCD grafts. Of these, 171 patients had cholangiograms. Post-operative cholangiographic findings were correlated with clinical data and divided into three groups: (A) normal cholangiograms with normal laboratory values, (B) abnormal cholangiographic appearance and laboratory values (cholangiopathy), and (C) radiologic abnormalities without laboratory abnormalities. Group B had four distinct abnormal cholangiographic patterns: hilar confluence nonanastomotic stenoses, multifocal progressive stenoses, centrifugal progressive stenoses, and rapid progression to peripheral duct necrosis. The varying patterns were predictive of graft survival. Group C had mild non-progressive multifocal stenoses and demonstrated decreased 1, 3, and 5 year graft and patient survival when compared with group A; although, cholangiopathy was not detected by laboratory data in these patients.

CONCLUSION
Patterns of nonanastomotic biliary abnormalities in DCD liver transplants can be defined radiologically. The pattern and severity of the radiographic findings correlate with clinical outcomes. Postoperative cholangiography can identify mild biliary abnormalities, which occur in a subclinical manner yet significantly decrease graft and patient survival in DCD liver transplants.

CLINICAL RELEVANCE/APPLICATION
The prognostic information from post-operative cholangiography may identify those DCD patients who require earlier, more aggressive intervention and earlier consideration for retransplantation.

LL-GIS-SU3B  ● The Effect of Slice Thickness on Image Noise and Image Quality in Abdominal CT with Advanced Reconstruction Algorithms: Initial Clinical Experience

Yingming Zhao (Presenter); Kexue Deng MD; Wei Wei; Shicheng Xu; Yingzi Luo

PURPOSE
To compare image noise and image quality of abdominal CT with images reconstructed to different thickness with filtered back projection (FBP), adaptive statistical iterative reconstruction (ASIR), and model based iterative reconstruction (MBIR) techniques.

METHOD AND MATERIALS
This prospective study was institutional review board approved, and written informed consent was obtained from all patients. A total of 20 patients underwent plain abdominal CT with a 64-detector CT scanner (Discovery CT750 HD; GE Healthcare). The projection data sets were reconstructed to images of 0.625mm, 1.25mm, 2.5mm and 5mm thickness with FBP, ASIR and MBIR. Image quality, including the boundary of the lesion, detail of the lesion and artifacts was blindy evaluated (excellent: 5; bad: 1) by two experienced radiologists. The mean CT values, image noise and contrast-to-noise ratio (CNR) relative to muscle for the liver with each algorithm were assessed. Paired t test was used for statistical analysis.

RESULTS
For images of 0.625mm, 1.25mm, 2.5mm and 5mm slice thickness, the average image noise with MBIR, ASIR and FBP were (10.9±1.4HU, 22.4±3.6HU and 32.1±5.5HU ), (9.4±1.1HU, 18.6±2.3HU and 27.4±3.9HU), (8.5±0.9HU, 14.0±2.3HU and 17.9±3.0HU) and (6.6±1.1HU, 9.7±1.5HU and 10.5±2.1HU), respectively. MBIR reconstructions revealed statistically lower image noises (p<0.05). Using MBIR, the scores of image quality for 4 different slice thickness were (4.3±0.7, 4.4±0.5, 5.0±0.0 and 5.0±0.0) which was significantly better as compared to ASIR (2.4±0.9, 2.7±0.5, 3.8±0.4 and 4.8±0.5); p<0.05.

CONCLUSION
Advanced MBIR reconstruction algorithms greatly reduces image noise and improves image CNR at 0.625mm slice thickness, and can replace conventional FBP images with 5mm slice thickness. This may further improve the visualization of small lesion and allow radiation reduction.

CLINICAL RELEVANCE/APPLICATION
MBIR techniques have the ability to reduce radiation dose through their improvement in image quality compared with available FBP, and can provide promising potentials for quantitatively image analysis.

LL-GIS-SU4B  ● Analysis of Liver Stiffness Using High Frequency Magnetic Resonance Elastography (MRE) at 7T on an Ex-vivo thin Liver Slices Rat Model

Maxime Ronot MD (Presenter); Simon Lambert; Mathilde Wagner; Sabrina Doblas PhD; Valerie Paradis; Ralph Sinkus PhD; Valerie Vilgrain MD; Bernard E Van Beers MD, PhD

PURPOSE
To develop a high-resolution MRE-assessed fibrous liver analysis in an ex-vivo rat model using MBIR techniques.

METHOD AND MATERIALS
Fibrosis was induced in rats using CCl4 intoxication. Rats were anesthetized and sacrificed, livers were resected and stored at -80°C. Rats had different stages of fibrosis: F0 (n=8), F1 (n=8), F2 (n=3), F3 (n=8), and F4 (n=15). Three (6%) rats were excluded due to technical problems during MRE. Liver elasticity significantly increased with the progression of fibrosis, with mean Gd values of 2.7 (+/-0.45) kPa for F0, 2.9 (+/-0.3), 3.0 (+/-0.16), 3.2 (+/-0.42), and 3.8 (+/-0.44) kPa for F0, F1, F2, F3 and F4 livers respectively (p<0.05).

CONCLUSION
Our ex vivo thin-liver slice rat model allowed accurate analysis of liver stiffness on MR at 7T.

CLINICAL RELEVANCE/APPLICATION
MRE could be a non-invasive biomarker for evaluation of liver fibrosis but requires further clinical and experimental explorations. Our results show a preclinical validation in a model of pure liver fibrosis.

LL-GIS-SU5B  ● A Clinical Approach to Adjusting Noise Index with Respect to Patient Size to Obtain Consistent Image Quality in CT

Dianna D Cody PhD (Presenter); Eric P Tamm MD; Nicolaus A Wagner-Bartak MD; Minesh P Patel ARRT; Xining Liu PhD; Corey T Jensen MD; Xiujing J Rong PhD

PURPOSE
Automated tube current modulation (TCM) as implemented by General Electric for CT is quite sensitive to patient size when a constant level of image noise is expected. This poses a severe clinical challenge to maintaining uniform image quality when patients of widely varying size present for abdomen-pelvis CT exams.

METHOD AND MATERIALS
Detailed patient size versus Noise Index (NI) tables were developed, and evaluated, in an incremental manner on a weekly basis. The image quality of each exam was scored by a radiologist. An analysis of these scores guided the adjustment of NI value in the table for the subsequent week. The tables were based on measured patient circumference (abdomen) and AP localizer radiograph lateral width.
LL-GIE-SU6B ● Magnetic Resonance Imaging-Extramural Vascular Invasion in Rectal Cancer and Synchronous Liver Metastases, Our Experience

Alberto C Seehaus MD (Presenter); Analia S Varela MD; Mariana Calvo; Marcos Quadrelli MD; Jesica L Savliuk MD; Ricardo D Garcia-Monaco MD, PhD; Sergio Terrasa; Valeria Vietto

PURPOSE
To show the experience in our center regarding the association between magnetic resonance imaging (MRI) - extramural vascular invasion (EMVI) and synchronous liver metastases in patients with rectal cancer.

METHOD AND MATERIALS
We performed a retrospective cohort study which included 71 patients, of whom 26 were male (36.62%) and 45 females (63.38%), all diagnosed with cancer of middle and lower rectum, which were evaluated with MRI at our institution for initial staging in the period from January 2011 to January 2012 inclusive.

All patients were evaluated with MRI for EMVI and were followed for a year to detect synchronous liver metastases by imaging methods (MRI, CT, ultrasound, positron emission tomography) or pathology after surgery. Multivariate analysis was performed by logistic regression to demonstrate the association of various predictors (MRI EMVI, gender, age) with synchronous liver metastases.

RESULTS
Of all patients, 68 completed the clinical follow-up in our center (95.77%). Of these, 20 had liver metastases during the observation period (29.41%), of whom 15 had signs of MRI EMVI (75%).

The incidence of synchronous liver metastases has a marginally significant association with the presence of MRI EMVI (OR, 3.35; 95% CI: 1.0001 - 11.2187) and female sex (OR, 4.86; 95% CI: 1.2117 - 19.5323). No association was found for the age variable.

CONCLUSION
The presence of MRI EVMI and female gender were predictors of development of synchronous liver metastases in patients with rectal cancer.

CLINICAL RELEVANCE/APPLICATION
Our experience suggests that MRI is a useful tool as a prognostic marker due to the association between MRI EMVI and the incidence of synchronous liver metastases.

LL-GSIE-SU8B ● A Systematic Review of Enhancement Patterns at Gadoxetate-Enhanced MRI for Diagnosis of Hypervascular HCC in Patients with Cirrhosis or Other Risk Factors for HCC

Kevin A Zand MD (Presenter); Eduardo A Costa MD; Ajinkya S Desai MBBS; Marilia P Ferreira MD; Masahiro Tanabe MD; Cynthia S Santillan MD; Claude B Sirlin MD *

PURPOSE/AIM
The purpose of this exhibit is to systematically review in patients with cirrhosis or other risk factors for HCC:

1. Enhancement patterns at Gadoxetate-enhanced MRI for diagnosis of hypervascular HCC.
2. The probability of HCC for each enhancement pattern.
3. The differential diagnosis for each enhancement pattern.

CONTENT ORGANIZATION
• Introduction: Four enhancement patterns at Gadoxetate-enhanced MRI have been described in the Radiology literature for diagnosis of hypervascular HCC in at risk patients. These patterns are based on relative enhancement in Arterial (A), Portal Venous/Transitional (PV/T), and Hepatobiliary (HB) phases. For each pattern we show schematic illustrations, selective images, the reported probability of HCC, and the differential diagnosis.

• Pattern 1: A=Hyper, PV/T=Hypo, HB=Any
• Pattern 2: A=Hyper, PV/T=Iso, HB=Hypo
• Pattern 3: A=Hyper, PV/T=Iso, HB=Iso
• Pattern 4: A=Hyper, PV/T=Iso, HB=Hyper

Summary

SUMMARY
The major teaching points of this exhibit are:

1. Pattern 1 is diagnostic for HCC. The positive predictive value for HCC diagnosis is nearly 100%.
2. Pattern 2 is highly suggestive but not diagnostic of HCC.
3. Patterns 3 and 4 usually indicate benign entities. However, they may be interpreted as intermediate or high suspicion for HCC depending on size and other imaging features.

LL-GIE1258-SUB ● Colorectal Cancer in the Era of Molecular Medicine: What the Radiologist Needs to Know

Rahul A Sheth MD (Presenter); Arun Krishnaraj MD, MPH

PURPOSE/AIM
Molecularly targeted therapies are revolutionizing cancer care. For colorectal cancer (CRC), the oncology community has recently gained insights into specific gene expression profiles that predict responsiveness to antibody therapy. We will summarize the relevant new branch points in the management of CRC, with a specific focus on the use of molecular therapies. We will also highlight the imaging features as
CONTENT ORGANIZATION

- Mutation analysis and molecularly targeted therapies
  - Microsatellite instability and chemotherapy
  - Bevacizumab
  - EGFR, KRAS, and BRAF and cetuximab/panitumumab

- Imaging in staging and management of CRC
  - Resectability and conversion to resectability
  - Liver volume and function
  - Molecular imaging for response to targeted therapies

- Imaging for specific complications of chemotherapy
  - Steatohepatitis with irinotecan
  - Hepatic toxicity of oxaliplatin
  - Venous thromboembolism of cetuximab/panitumumab
  - Bowel perforation with bevacizumab

SUMMARY

The expanding repertory of molecularly targeted therapies offers new opportunities and challenges for the radiologist. Imaging will serve as a pivotal tool for identifying the appropriate use, efficacy, and complications of these drugs.
hyperplasia, adenomas, metastases, cholangiocarcinoma and abscesses. The pathologic characteristics including central scar in focal nodular hyperplasia, the presence of fat in adenomas and hepatomas, and characteristic enhancement pattern of lesions will be discussed. Difficulties and limitations in the diagnosis of these lesions will be discussed. The importance of optimal protocols and newer techniques will be emphasized.

**RC109B • Focal Liver Masses in Cirrhotic Patients**

**Yves M Menu MD (Presenter)**

**LEARNING OBJECTIVES**
1) Comprehend why imaging is the key for detection and characterization of liver tumours in a cirrhotic patient. 2) Understand the advantages and limits of US, CT and MRI. 3) Apply the appropriate protocols for CT and MRI. 4) Be able to give a comprehensive report answering the clinical questions, with the perspective of the different options for treatment and/or follow-up.

**ABSTRACT**
Focal Liver Masses (FLM) in a cirrhotic patient are challenging for detection and characterization for two reasons: - improvement of potential treatments increases the percentage of patients who are candidate for a specific treatment. However, the cost of these treatments, from systemic chemotherapy to liver transplantation, implies that any medical decision should rely on solid arguments, most of them being provided by imaging - in a cirrhotic liver, a wide spectrum of masses can be observed, from completely benign lesions like focal fatty infiltration or Regenerative Nodules (RN) to highly aggressive Hepatocellular Carcinoma (HCC). More over, there is a continuum between benign and malignant lesions with intermediate lesions like Dysplastic Nodules (DN). Characterization is therefore challenging due to overlapping of imaging features Ultrasound (US) plays an important role in detection of HCC, and helps also assessing vein patency, ascites and development of collaterals. However, characterization of FLM with plain US is rather limited. CT is an efficient method for detection and characterization of liver masses, and more over allows a global staging in case of malignant disease. However, there is increasing evidence that MRI is superior to CT both for detection and for characterization of liver masses, at least if the appropriate protocol is used. The role, advantages and limits of every method differ according to the clinical situation (detection, characterization, staging, follow-up). The precise features of nodules (RN, DN and HCC) should be identified and reported by the Radiologist, with the perspective of the appropriate treatment or follow-up. The radiologist should be able to give an adapted report, including all key information for patient management, and taking into account international standards (EASL, AASLD), which greatly help in making a medical decision.

**RC109C • Contrast Media in Liver MRI: From Morphology to Function**

**Giuseppe Brancatelli MD (Presenter) * **

**LEARNING OBJECTIVES**
1) To discuss the MR protocols typically used with extracellular and liver specific contrast agents. 2) To understand how liver-specific contrast agents can assist in the characterization of focal lesions in the cirrhotic and non-cirrhotic liver. 3) To review the most common pitfalls linked to the use of liver specific contrast agents. 4) To get familiar with the role of liver specific contrast agents in the diagnosis of biliary diseases.

**ABSTRACT**

**Imaging the Bariatric Surgery Patient (An Interactive Session)**

**Sunday, 03:15 PM - 04:15 PM • S402AB**

**MSRA14 • AMA PRA Category 1 Credit ™:1 • ARRT Category A+ Credit:1**

**Daniel T Myers**, MD

**LEARNING OBJECTIVES**
Radiology plays an important role in the assessment of our bariatric surgery patients. It is vital for the radiologist assistant to understand the gastrointestinal anatomy and surgical procedures and specific patient issues associated with bariatric surgery. This session will include review of normal anatomy vs altered anatomy post-bariatric surgery with an emphasis on the identification of post-surgical complications.

**Gastrointestinal Series: Emerging Issues in Abdominal CT**

**Monday, 08:30 AM - 12:00 PM • N227**

**VSGI21 • AMA PRA Category 1 Credit ™:3.25 • ARRT Category A+ Credit:4**

**Moderator**

**Giles W Boland**, MD

**Moderator**

**Jonathan B Kruskal**, MD, PhD *

**VSGI21-01 • Oral Contrast Issues**

**Perry J Pickhardt MD (Presenter) * **

**LEARNING OBJECTIVES**
1) Understand the relative advantages and disadvantages of the use of positive oral contrast in abdominal CT imaging for a wide variety of clinical scenarios.

**VSGI21-02 • Discontinuation of Positive Oral Contrast for Routine CT Scans Does Not Result in Substantial Repeat Scans**

**Wilbur Wang BA (Presenter) ; Nikita Shah ; Michael A Ohliger MD, PhD ; Yanjun Fu PhD ; Zhen J Wang MD ; Benjamin M Yeh MD * **

**PURPOSE**
To evaluate the rate of repeat scans after an institution-wide policy to discontinue the routine administration of positive oral contrast in favor of oral tap water for routine abdominal CT examinations.

**METHOD AND MATERIALS**
From a total of 12,370 abdominal CT scans performed at our institution from March 9, 2009 to June 26, 2012, we identified all repeat abdominal CT scans occurring between 2 hours and 14 days after an initial abdominal CT scan. On March 9, 2009 our department discontinued the routine administration of positive oral (iodinated) contrast in favor of oral tap water for such scans. Readers recorded the presence of oral and IV contrast in both initial and repeat abdominal CT scans images. For scans in which positive oral contrast was given, the reason for administering oral contrast was given.

**RESULTS**

**Back to Top**
From a total of 12,370 abdominal CT examinations, 439 (3.5%) were repeat scans, and of these, 47 scans (10.7%) used oral contrast on the repeat CT scan but not the initial. The most common reasons for administration of oral contrast were for evaluation of abscesses (40.0%), evaluation for perforation (33.1%), and obstruction (13.1%). Only 11 out of the 439 repeat scans (2.5%) were explicitly performed due to a need for oral contrast in the repeat scan (0.09% of all scans). Significantly fewer repeat scans used oral contrast (either on the initial study or repeated study) in 2012 (5 of 60 scans, or 8.3%) compared with 2009 (76 of 215 scans, or 35.3%, P < .001).

**CONCLUSION**

The discontinuation of positive oral contrast from routine abdominal CT protocols at our institution led to a miniscule frequency of repeat examinations (0.09% of all scans) which diminished over 3 years. Our findings support the continuation of this policy, especially when weighed against the inconvenience, expense, and potential complications of administering oral contrast to every patient.

**CLINICAL RELEVANCE/APPLICATION**

Discontinuation of positive oral contrast from routine abdominal CT exams does not result in a substantial frequency of repeat examinations with oral contrast.

**VSGI21-03 • Radiation Reduction Techniques**

**Rendon C Nelson** MD (Presenter) *

**LEARNING OBJECTIVES**

1) To understand the pros and cons of radiation dose reduction in CT. 2) To learn methods for radiation dose reduction that do not impact image quality. 3) To learn methods for radiation dose reduction that do impact image quality. 4) To understand the implications of using iterative reconstruction techniques for CT.

**VSGI21-04 • Abdominal CT Radiation Doses (Conventional and Organ Doses) from Large Academic Institute with 3 Scan Vendors and Different Iterative Reconstruction Techniques**

**Tarek M. Al-Saadi** MD, **Rajat Mistry** MD, **Satish V. Reddy** MD (Presenter) *

**METHOD AND MATERIALS**

This IRB-approved, HIPAA-compliant study included 8758 consecutive abdomen-pelvis CT exams (mean age: 59.3±16.6 years; M:F = 4469:4288). Automatic dose monitoring software (Exposure, Bayer) was used to retrieve patient demographics, including date of birth, gender, weight, patient maximum skin to skin diameters, CTDIVol, DLP, effective doses, Size Specific Dose Estimates (SSDE), as well as organ doses. Selected scan protocols and scanner models with information on Iterative Reconstruction (IR) were also recorded. Analysis of variance was used to evaluate differences across above variables. P-value of 0.05 with 95% confidence interval was considered significant.

**RESULTS**

Distribution of CT examinations per scanner included 16-slice GE (n=3200), 64-slice GE (n=1730), 64-slice Philips (n=176), 128-Siemens (n=221) and 256-Philips (n=724). Abdominal CT were performed with several clinical protocols, including routine abdominal CT (n=2963), stone/ hematoma (n=570) and cancer follow up (n=1385). Stone protocols were performed more commonly on 64-GE with mean CTDIVol (n=344, 8.5±3.3 mGy), 16 GE (n=220, 10.5±3.8 mGy), and 256-Philips (n=144, 8.4±4 mGy). Routine abdominal CT were stratified by weight groups, less than 135lbs (n=683, 6.4±2 mGy), 135-200lbs (n=2257, 9.2±2.5 mGy), 200-300lbs (n=812, 13 ± 3.2 mGy) and more than 300lbs (n=51, 26±8 mGy). Estimated effective doses for iterative reconstruction scanners were 8.3±3 (n=764, Discovery750HD) 9±3 (n=133, Definition FLASH) and 7±3 (n=124, Brilliance iCT). Organ doses are summarized in a graphical manner in figure 1.

**CONCLUSION**

Clinical indication, CT scanner, and size based variations in abdominal CT protocols help in optimization of radiation doses. Although CT dose indexes provide good estimates for comparing across CT scanners, organ doses should be used for comparing patient doses.

**CLINICAL RELEVANCE/APPLICATION**

Abdominal CT examinations doses ranged from 6 to 26 mGy and hence it is important to optimize based on clinical indication, weight and iterative reconstruction technique.

**VSGI21-05 • Observer Performance for Site-specific Detection and Correct Classification of Malignant Liver Lesions for an Image-based Denoising Method and Iterative Reconstruction**

**Joel G Fletcher** MD (Presenter) *; **Lifeng Yu** PhD; **Zhoubo Li**; **Armando Manduca** PhD *; **Daniel J Blezek** PhD; **David M Hough** MD; **Sudhakar K Venkatesh** MD, FRCR; **Gregory C Brickner** MD; **Joseph G Cernigliaro** MD; **Amy K Hara** MD *; **David Lake**; **Maria Shiung**; **David Lewis**; **Shuai Leng** PhD; **Kurt E Augustine** MS; **Rickey Carter** PhD; **David R Holmes** PhD; **Cynthia H McColloough** PhD *

**PURPOSE**

Noise reduction techniques may improve subjective image quality, but few studies have addressed impact on diagnostic performance. Our purpose was to determine if lower dose (LD) CT images reconstructed with image-based noise reduction (Noise Map; NM) or an IR technique (SAFIRE) improved subjective observer performance for detection of primary or secondary liver tumors (LTs), compared to routine dose filtered back projection (FBP) images.

**METHOD AND MATERIALS**

CT projection data from 60 CT exams were collected (30 abdomen at 16 mGy, 30 liver at 23 mGy; 31 with LTs). Presence of LTs was defined by progression/regression on CT/MR or pathology. Using a validated noise insertion tool, LD FBP, LD NM, and LD SAFIRE images were created corresponding to 12 mGy (abd) or 14 mGy (liver). In each reading session, 3 readers randomly evaluated either routine dose FBP, LD FBP, LD NM, or LD SAFIRE images. 3 mm CT images were reviewed on a dedicated computer workstation, with readers circling all liver lesions, then selecting a diagnosis (LT vs. individual benign diagnoses) and confidence score (0-100), and grading image quality. Reference detections were similarly marked, with automated matching of reference and reader lesions using an overlapping spheres method. JAFROC analysis was performed on a per-lesion basis for LTs, with true positives correctly localized and classified. A limit of non-inferiority of -0.1 was defined a priori.

**RESULTS**

There were 73 LTs with a median size of 1 +/- 1 cm. The JAFROC figure of merit (FOM) overlapped for routine dose FBP, LD FBP, and LD NM (Fig. 1). JAFROC CI was 0.84 ± 0.95, 0.79 ± 0.93, 0.82 ± 0.95, respectively for routine FBP, LD FBP, LD NM, with the estimated differences between routine FBP and LD FBP or NM being non-inferior. Similarly, JAFROC FOM was similar between routine dose FBP and each LD approach in the subset of 44 cases with SAFIRE (0.97 vs. 0.94, 0.93, 0.94), with LD approaches being non-inferior. Diagnostic image quality was greatest for LD images with noise reduction (P < 0.03 all readers).

**CONCLUSION**

Lower dose CT images reconstructed with FBP, NM and SAFIRE can be interpreted without loss of diagnostic performance despite the improved image quality of NM and SAFIRE.

**CLINICAL RELEVANCE/APPLICATION**


VSGI21-06 • Prospective Evaluation of Prior Image Constrained Compressed Sensing (PICCS) Algorithm in Abdominal CT: Preliminary Results Comparing Reduced Dose with Standard Dose Imaging

Meghan G Lubner MD (Presenter); David H Kim MD *; Jie Tang PhD; Perry J Pickhardt MD *; Alejandro Munoz Del Rio PhD; Guang-Hong Chen PhD *

PURPOSE
To report preliminary prospective results of an ongoing CT dose reduction trial using Prior Image Constrained Compressed Sensing (PICCS).

METHOD AND MATERIALS
50 patients (23 F, 27 M, mean age 57.7 years, mean BMI 28.6) were scanned in this HIPAA compliant, IRB approved study. Immediately following routine contrast-enhanced (n=26) or unenhanced (n=24) abdominal MDCT, a second reduced dose (RD), matched series scan was performed (target dose reduction 70-90%). DL, CTDIvol and SSD were compared between scans. Multiple reconstruction algorithms (standard filtered back projection (FBP), adaptive statistical iterative reconstruction (ASIR), and Prior Image Constrained Compressed Sensing (PICCS)) were applied to the RD series. Standard dose images (SD) were reconstructed with FBP (reference standard). Two blinded readers evaluated each series for subjective image quality and diagnostic performance. Further study is needed to determine optimal dose reduction level to maintain acceptable diagnostic accuracy.

RESULTS
Mean DLP, CTDIvol, effective diameter and SSDE for the RD series was 140.3 mGy*cm (median 79.4, range 15.9-526.6), 3.7 mGy (median 1.8, range 0.4-26.4), 30.1 cm (median 30, range 24.6-38.9), and 4.15 mGy (median 2.31 range 0.59-24.3) compared to 493.7 mGy*cm (median 345.8, range 57-1453.7), 12.9 mGy (median 7.9 mGy, range 1.43-79.8) and 14.6 mGy (median 10.1, range 2.1-73.4) for the SD series respectively. This is a mean SSDE reduction of 72%. RD PICCS image quality score was 2.8±0.5, improved over the RD FBP and RD ASIR scores (1.7±0.7 and 1.9±0.8 respectively), but less than the SD score of 3.5±0.5 (p < 0.005).

PICCS allows for marked dose reduction at abdominal CT at the expense of subjective image quality scores and diagnostic performance.

CLINICAL RELEVANCE/APPLICATION
PICCS allows for substantial CT dose savings (70-90%), lowering the dose for some applications (urolithiasis, colon ca screening) into the sub-mSv range.

VSGI21-08 • Dual Energy CT

Alec J Megibow MD, MPH (Presenter) *

LEARNING OBJECTIVES
1) Understand basic physical principles that support Dual Energy CT applications for abdominal imaging. 2) Familiarize audience with radiation dose and image quality as they relate to Dual Energy CT. 3) Demonstrate the value of unique dual energy CT capabilities drawing on examples from abdominal imaging capabilities.

VSGI21-09 • Can Multi-material Decomposition Algorithm Generated Virtual Unenhanced (VUE) Images from Single Source Dual-energy CT meet the Qualitative and Quantitative Expectations of True Unenhanced (TUE)?

Mukta D Agrawal MBBS, MD (Presenter) *; Jorge M Fuentes MD; Avinash R Kambadakone MD, FRCR; Yasir Andrahi MD, MPH; Shaheen Sombans MBBS; Jannareddy Namrata Reddy MBBS; Koichi Hayano MD; Dushyant V Sahani MD

PURPOSE
We investigated the performance of recent commercially available multi-material decomposition (MMD) algorithm rendered VUE images for image quality/texture improvements and attenuation (HU) measurements.

METHOD AND MATERIALS
In IRB approved prospective study, 33 consecutive patients had arterial and delayed phase ssDE-CTA (GE discovery CT750 HD) of the abdomen for AAA. The VUE images were generated using MMD algorithm. Each patient also had true unenhanced exam (TUE) for comparison. Three independent readers assessed the image quality and acceptance of VUE for TUE using a four-point scale. Visualization of incidental findings such as renal stones, vascular calcification, fatty liver, and cysts was evaluated. For quantitative measurement, attenuation values (HU) of liver, kidney, muscle and background fat were obtained on TUE and VUE. Pearson correlation coefficient was used for statistical analysis.

RESULTS
The MMD-VUE images were rated acceptable in all 33 exams and actually preferred by all three readers over TUE (IQ score 3 vs 2.1). All renal stones (n=17), vascular calcification, fatty liver infiltration, and cysts were accurately detected on MMD-VUE images. The mean HU on MMD-VUE demonstrated good to excellent correlation with TUE values for liver (r=0.85), kidney (r=0.7), muscle(r=0.82) and fat (r=0.9). The mean attenuation difference (HU) between TUE-VUEa, TUE-VUEd and VUEa-VUEd for liver, kidney, muscle and background fat were obtained on TUE and VUE. Pearson correlation coefficient was used for statistical analysis.

CONCLUSION
The MMD algorithm rendered VUE images meet the clinical expectations of quality and quantitative measurements and therefore a viable replacement of TUE.

CLINICAL RELEVANCE/APPLICATION
Virtual unenhanced CT images that are quantitatively and qualitatively comparable to true unenhanced CT images are expected to bring workflow and radiation dose savings benefits.

VSGI21-10 • The Clinical Impact of Retrospective Analysis in Spectral Detector Dual Energy Body CT

Michal H Gabbai MD (Presenter); Isaac Leichter PhD; Zimam Romman *; Amiaz Altman PhD *; Jacob Sosna MD *

PURPOSE
In existing tube-based dual-energy CT (DECT), dual-energy protocols must be prescribed in advance to select tube voltage or operate the two tubes at different kV. Spectral detector-based DECT enables retrospective reconstruction and analysis of data obtained from a single CT acquisition with no requirement to plan a dual-energy protocol in advance. The purpose of this study was to assess the potential added value of retrospective dual-energy reconstruction features.

METHOD AND MATERIALS
A total of 43 patients were scanned with a novel Spectral Detector CT (SDCT) prototype (Philips Healthcare, Cleveland, OH, USA). IRB approval and patient consent were obtained. The clinical indication for each case was evaluated, and indications were compared to the final diagnosis by two radiologists in consensus. The number of cases in which retrospective analysis of spectral data could potentially assist in the diagnosis while the indication on the request did not suggest in advance the use of dual-energy reconstruction was analyzed.

RESULTS
SDCT data helped to achieve the diagnosis for 19 out of 43 patients (44%). In 8 of the 43 (18.6%), clinical history on the study request indicated potential advantage from use of a dual-energy protocol (4 suspected pulmonary emboli, 2 suspected kidney stones, 1 suspected insulinoma, 1 suspected hepato cellular carcinoma). In the remaining 35 patients, dual-energy reconstruction was not indicated from the
Perfusion of HCC. Perfusion CT and IVIM-DWI can quantitatively assess the hepatic perfusion in patients with HCC, even though there was no significant correlation with those obtained from intravoxel incoherent motion diffusion (IVIM)-diffusion weighted imaging (DWI) found between the perfusion CT and IVIM-DWI parameters.

RESULTS
Regarding the perfusion CT, BF, BV, AP, TLP and HPI were significantly higher, whereas PS and PP were significantly lower in HCC than in the liver parenchyma. The perfusion parameters statistically analyzed comparing HCC and liver parenchyma.

CONCLUSION
Perfusion CT and IVIM-DWI can quantitatively assess the hepatic perfusion in patients with HCC, even though there was no significant correlation between the parameter of the two modalities.

CLINICAL RELEVANCE/APPLICATION
Quantitative assessment of hepatic perfusion using perfusion CT and IVIM-DWI can provide important information about the hepatic perfusion of HCC.
Gastrointestinal (Hepatocellular Carcinoma Imaging)

Sunday, 10:30 AM - 12:00 PM • E353A

SSC05-03 • ARA Category 1 Credit™•1.5 • ARRT Category A+ Credit:1.5

Moderator
Keyanoosh Hosseinzadeh, MD *

Moderator
Steven S Raman, MD

Moderator
Elmar M Merkle, MD *

SSC05-05 • 'Delayed Washout' on the Hepatospecific Phase of Gd-BOPTA MRI in the Characterisation of Arterial-enhancing HCCs Lacking Washout on the Portal Venous and Equilibrium Phases

Kelvin Cortis MD, MRCS, FRCR (Presenter) ; Rosa Liotta ; Roberto Miraglia MD ; Settimo Caruso ; Vincenzo Carollo MD ; Angelo Luca MD

PURPOSE
The current cornerstone of HCC diagnosis is the wash-in(WI)/wash-out(WO) enhancement pattern. However, there remain a significant proportion of hypervascular HCCs lacking WO on the portal venous and/or equilibrium phases. We investigated the possible role of the hepatospecific phase on gadobenate dimeglumine-enhanced MR imaging (Gd-BOPTA-MRI) in further characterising HCCs lacking the typical WI/WO pattern.

METHOD AND MATERIALS
Ninety-seven consecutive patients who underwent liver transplantation between 2004 and 2012 and Gd-BOPTA-MRI within three months of surgery were enrolled. Two experienced radiologists performed a nodule by nodule analysis, which was followed by liver explant correlation. Delayed WO was defined as hypointensity on the hepatospecific phase in arterial-enhancing nodules lacking WO on the portal venous and/or equilibrium phases.

RESULTS
Imaging was performed 41.7±25.4 days prior to transplantation. 295 lesions were identified on histopathology, of which 240 were HCCs. 47 HCCs with massive necrosis after percutaneous treatment were eliminated. Of the remaining 193 HCCs, 48 were not detectable on imaging (24.9%). The 145 HCCs seen on imaging showed WI/wo (n=68;46.9%), arterial enhancement without WO (n=55;37.9%), and hypovascularity on arterial and venous sequences (n=22;15.2%). The WI/wo pattern was observed only in HCC. 23 of the 55 arterially-enhancing HCCs lacking WO (41.8%) showed delayed WO. This pattern was only observed in 3 other nodules (2 cholangiocarcinomas, 1 regenerative nodule). Hypointensity on the hepatospecific phase was not sensitive in detecting hypovascular HCCs. Combining delayed WO with WI/wo raises the sensitivity of HCC characterisation from 46.9% to 62.8%, with a minor decrease in the positive predictive value (PPV) (from 100% to 96.8%).

CONCLUSION
A significant proportion of arterial-enhancing nodules lacking WO demonstrate delayed WO on the hepatospecific phase of Gd-BOPTA-MRI. When coupled with WI/wo, delayed WO augments sensitivity of HCC characterisation with no significant compromise on the PPV.

CLINICAL RELEVANCE/APPLICATION
This phenomenon increases the sensitivity of HCC characterisation when used alongside the cornerstone wash-in/wash-out pattern, with no significant compromise on the PPV.

SSC05-02 • Differentiation of Small (≤2 cm) Hepatocellular Carcinoma from Small (≤2 cm) Benign Nodule in Cirrhotic Liver on Gadoxetic Acid-enhanced and Diffusion-weighted MR Images

Gil-Sun Hong MD (Presenter) ; Jae Ho Byun MD ; Heon-Ju Kwon MD ; So Yeon Kim ; Kyoung WonKim MD ; Hyung Jin Won MD ; Yong Moon Shin ; Pyo Nyun Kim MD

PURPOSE
To identify characteristic imaging features that differentiate small (≤2 cm) hepatocellular carcinoma (HCC) from small (≤2 cm) benign nodule in the cirrhotic liver on gadoxetic acid -enhanced and diffusion-weighted (DW) magnetic resonance (MR) images.

METHOD AND MATERIALS
This retrospective study was approved by our institutional review board, and informed consent was waived. We included 230 cirrhotic patients with 222 pathology-confirmed small HCCs and 61 benign nodules including 28 pathology-confirmed dysplastic nodules (diameter, 0.5-≤2 cm), who underwent gadoxetic acid-enhanced and DW MRI imaging. In consensus, two radiologists analyzed signal intensity of the HCCs and benign nodules at each MR sequence and rim enhancement during the portal or equilibrium phases. The findings relevant as predictors of small HCCs were identified using univariate and multivariate logistic regression analyses. The combinations of significant MR findings in multivariate analysis were compared with American Association for the Study of Liver Disease (AASLD) practice guideline (a combination of arterial enhancement and portal or delayed washout) using McNemar test.

RESULTS
On multivariate analysis, arterial enhancement (adjusted odds ratio [OR], 8.7), T2 hyperintensity (adjusted OR, 6.2), and hyperintensity on DW images (adjusted OR, 2.6) were significant for differentiating small HCCs from benign nodules. Sensitivity and accuracy were significantly higher than those of AASLD practice guideline (91% vs. 81% and 89% vs. 83%, respectively; each P=0.006).

CONCLUSION
On gadoxetic acid-enhanced and DW MR images, arterial enhancement and hyperintensity on T2-weighted image and on DW images are helpful for differentiating small HCCs from benign nodules in patients with liver cirrhosis.

CLINICAL RELEVANCE/APPLICATION
Our proposed criteria of MR images can be a potential alternative to the AASLD practice guideline in diagnosing small HCCs in patients with liver cirrhosis on gadoxetic acid-enhanced and DW MR images.

SSC05-03 • Clinical Features of Hepatocellular Carcinoma Showing Isointense or Hyperintense on Hepatocyte-phase of Gadoxetic Acid-enhanced Magnetic Resonance Imaging; Radiologic-pathologic Correlation in Surgically Resected Cases

Katsuhiro Sano MD (Presenter) ; Utoroh Motosugi MD ; Hiroyuki Morisaka MD ; Shintaro Ichikawa MD ; Tomoaki Ichikawa MD, PhD *

PURPOSE
Hepatocellular carcinoma (HCC) commonly demonstrates hypointense on hepatocyte-phase of gadoxetic acid-enhanced magnetic...
resonance (EOB-MR) imaging. However, some cases of hepatocellular carcinoma show isointense or hyperintense on hepatocyte-phase of EOB-MR images, which is a pitfall for diagnosing HCC. The purpose of this study was to elucidate the radiological and histopathological features of HCC that appear isointense or hyperintense on hepatocyte-phase of EOB-MR images.

METHOD AND MATERIALS
In this study, 24 HCCs in 23 patients (mean age; 71.1, 18 males and 5 females, mean tumor size; 32.4mm) who were surgically resected from January 2008 to March 2012 were included. Inclusion criteria of HCC were more than 0.9 of EOB enhancement ratio (tumor to liver contrast on hepatocyte-phase / tumor to liver contrast on precontrast image). All tumors were retrospectively reviewed of enhancement of arterial-phase, bile juice production, histopathological grading, and 1 and 3 year survival rate, and 1 and 3 year recurrence-free survival rate.

RESULTS
Twenty-one nodules (88%) showed hypervascular on arterial-phase of EOB-MR images. In gross pathologically, 13 (54%) cases showed green hepatoma producing bile juice. In histopathological findings, all cases were diagnosed as well to moderately-differentiated HCC with no case of poorly-differentiated HCC. The survival rate of 1 and 3 years are 100%. Recurrence-free survival rate of 1 and 3 years are 67% and 56%, respectively.

CONCLUSION
This study demonstrated that poorly-differentiated HCC was not included in the HCC showing isointense or hyperintense on hepatocyte-phase of EOB-MR images. HCC showing isointense or hyperintense on hepatocyte-phase of EOB-MR images tend to show good survival rate.

CLINICAL RELEVANCE/APPLICATION
In our study, clinical features of HCC showing isointense or hyperintense on hepatocyte-phase of EOB-MR images tend to show good survival rate.

SSC05-04  • Diagnostic Performance of Delayed Hepatobiliary Imaging Post Gadoxetic Acid Combined with DWI vs. Dynamic Contrast-enhanced Imaging for HCC Detection

Cecilia Besa MD (Presenter); Nancy A Cooper MD; Sara Lewis MD; Amita Kamath MD; Sasan Roayaie; Bachir Taouli MD *

PURPOSE
To compare the diagnostic performance of hepatobiliary phase imaging (HBP) post gadoxetic acid combined with diffusion-weighted imaging (DWI) vs. dynamic contrast-enhanced (CE) T1-weighted imaging (T1WI) for hepatocellular carcinoma (HCC) detection.

METHOD AND MATERIALS
203 consecutive patients at risk of HCC who underwent gadoxetic acid-enhanced MRI from 01/2011 to 12/2011 were included in this IRB approved retrospective single center study. Two sets of images were analyzed independently by 2 readers: HBP/DW-set (HBP + DWI using b 0-50-500-1000) and dynamic CE-set (pre-contrast, arterial, portal venous and late venous 3D T1WI after administration of 10 ml of gadoxetic acid). Reference standard was represented by consensus interpretation of 2 separate readers using combination of imaging, clinical and pathologic data. HCCs were defined as lesions > 1 cm with hypointensity on HBP and/or restricted diffusion (hyperintensity on b500/1000 and low ADC) on HBP/DW-set and typical wash-in/wash-out on the CE-set (AASLD criteria). Per lesion and per patient sensitivity, specificity, PPV and NPV were calculated for each image

RESULTS
CONCLUSION
Initial data demonstrate similar sensitivity, slightly lower specificity and equivalent NPV when using a combination of HBP imaging post gadoxetic acid and DWI compared to ASSLD criteria for detection of HCC > 1 cm. This combination has potential for HCC screening.

CLINICAL RELEVANCE/APPLICATION
A fast post-contrast liver MRI protocol consisting of gadoxetic acid injection outside the MR room with DWI can be used for HCC screening, which could provide shorter and possibly less expensive exams.

SSC05-05  • Pilot Study to Evaluate the Diagnostic Per-patient Accuracy of a Limited Hepatobiliary Phase-gadoxetate Enhanced MRI for Hepatocellular Carcinoma Surveillance

Robert M Marks MD (Presenter); Andrew Ryan MD; Elhamy R Heba MBCh; An Tang MD; Claude B Sirlin MD *; Mustafa R Bashir MD *

PURPOSE
To evaluate the diagnostic performance of an abbreviated gadoxetate-enhanced MRI protocol as a potentially low-cost alternative to conventional MRI for hepatocellular carcinoma surveillance in the setting of chronic liver disease.

METHOD AND MATERIALS
This pilot dual center retrospective cross-sectional study was IRB approved at both institutions where informed consent was waived. 299 consecutive patients at risk for HCC that were in an MRI-based HCC surveillance program between October 28, 2008 and January 31, 2010 were included in the study. For each patient, their first gadoxetate-enhanced MRI was evaluated as the index study. Two readers, blinded to the history and clinical interpretation of the study, independently read two image sets per patient: set 1 included T1w 20-minute hepatobiliary phase images and a T2w SSFSE sequence; set 2 included diffusion-weighted imaging and set 1. For each image set per patient, each nodule larger than 10mm was scored using a 5 point predetermined scoring grid and the highest scoring nodule was clinical and pathologic data. HCCs were defined as lesions > 1 cm with hypointensity on HBP and/or restricted diffusion (hyperintensity on b500/1000 and low ADC) on HBP/DW-set and typical wash-in/wash-out on the CE-set (AASLD criteria). Per lesion and per patient sensitivity, specificity, PPV and NPV were calculated for each image.

RESULTS
CONCLUSION
Due to its high negative predictive value, an abbreviated MRI protocol with T2-weighted SSFSE and hepatobiliary phase sequences may be an acceptable, low cost alternative to a complete MRI in the setting of chronic liver disease at centers that rely on MRI for HCC surveillance.

CLINICAL RELEVANCE/APPLICATION
This limited MRI may be an acceptable alternative to dynamic conventional MRI's and could potentially reduce costs and improve throughput for patients in an MRI surveillance program for HCC.

SSC05-06  • Radiopathological Correlation of Hepatocellular Carcinoma in Transplant Patients. MR Evaluation with Gadoxetic Acid

Nehal Shah MBBS, FRCR (Presenter); Raneem Albazaz MBCh; Andrew F Scarsbrook FRCR; Maria B Sheridan MD; James A Guthrie MBCh *

PURPOSE
To evaluate the clinical performance of MRI using Gadoxetic acid in the detection of patients with hepatocellular carcinoma (HCC) and the disease burden within a transplant population.

METHOD AND MATERIALS
A retrospective analysis was performed of the MRI and explant histology reports of patients receiving liver transplants between January 2011 and April 2013. MRI and histologically detected HCC were recorded and correlated as were the indications for transplantation. Comparison was made with an initial cohort of patients and the total study population.

RESULTS
166 adult patients received a liver transplant over the study period. The indications included acute liver failure (6), alcoholic liver disease (45), Primary biliary cirrhosis (16), primary sclerosing cholangitis (20), viral hepatitis (34), alcoholic liver disease and hepatitis (7) and miscellaneous (38). 131 patients had an MRI scan preoperatively for evaluation of HCC and 40 patients had image positive hepatocellular carcinoma. With histological correlation on a per patient basis, MRI was 100% sensitive and 98.9% specific in detecting HCC. One patient was diagnosed with multifocal HCC on MRI but only had multiple dysplastic nodules. A total of 83 histological HCCs were detected with 76 true positives, 7 false negatives and 9 false positives on imaging. This equates to a sensitivity of 91.6% on a per lesion basis. All patients transplanted had tumour burdens within Milan criteria on explant histology. There was no difference in the diagnostic performance between the early and total population.

CONCLUSION
Concerns in changing practice from a dual contrast technique using superparamagnetic iron oxide and gadolinium to a gadoxetic acid technique were unfounded. Performance in identifying patients with HCC within transplant criteria was high as was the per lesion correlation.

CLINICAL RELEVANCE/APPLICATION
MR imaging with hepatobiliary contrast agent may improve the diagnostic accuracy of MR in the detection of focal liver lesions in cirrhotic patients.

Pre liver transplantation MRI with gadoxetic acid has a high sensitivity for detecting HCC on a per patient and per lesion basis.

SSEC05-07 Detection of Hepatocellular Carcinoma (HCC) in Liver Transplant Candidates: Intraindividual Comparison of Gadobenate Dimeglumine (Gd-BOPTA) Enhanced MR Imaging and Multiphasic 64-slice CT

Michele Di Martino (Presenter); Rossella DiMiscio; Concetta V Lombardo; Bruna Cerbelli; Sandro Bosco; Maddalena D’Addario; Carlo Catalano MD

PURPOSE
To intraindividually compare gadobenate dimeglumine (Gd-BOPTA) enhanced MRI and 64-slice CT for detection of HCC in patients with cirrhosis.

METHOD AND MATERIALS
Informed consent and ethical approval were obtained. Eighty-five consecutive patients with 104 HCC nodules underwent MRI at 1.5T (Avanto, Siemens) and 64-slice CT (Sensation 64, Siemens) at a mean interval of 14 days (range, 10-20 days). All patients underwent transplantation within 60 days. MR acquisitions comprised unenhanced breath-hold T2W images and volumetric 3D Gd-BOPTA-enhanced (0.1 ml/kg; MultiHance®, Bracco) T1W GRE images acquired at 25s, 60s, 180s (dynamic phase) and 90 min (hepatobiliary phase). 64-slice CT was performed with 0.6 x 64 mm collimation, 3-mm section thickness, 250 mAs, 120 kVp. A triple-phase protocol was started 18s, 60s and 180s after reaching a trigger threshold of 150 HU above baseline CT number in the aorta. Image analysis was independently performed by two observers in two sessions separated by 4 weeks. Findings were compared directly with explanted liver pathology results. Diagnostic accuracy was evaluated using the receiver operating characteristic (ROC) method. Sensitivity, specificity, PPV and NPV with corresponding 95% confidence intervals were determined.

RESULTS
The mean area under the ROC curve for Gd-BOPTA MRI (0.78) was higher than that of CT (0.76). On a lesion-by-lesion basis, the mean sensitivity (73%) of Gd-BOPTA MRI was significantly higher than that of CT (63.4%) (P<0.05). Gd-BOPTA-enhanced MRI is significantly more accurate and sensitive than 64-slice CT for the diagnosis of HCC in patients with cirrhosis prior to liver transplantation.

CONCLUSION
Gd-BOPTA-enhanced MRI is significantly more accurate and sensitive than 64-slice CT for detection of HCC in patients with cirrhosis.

CLINICAL RELEVANCE/APPLICATION
MRI imaging with hepatobiliary contrast agent may improve the diagnostic accuracy of MR in the detection of focal liver lesions in cirrhotic patients.

SSC05-06 Retrospective Comparison of MRI Sequences for Prediction of Size of Hepatocellular Carcinoma Based on Explant Evaluation

Claudia R Seuss MD (Presenter); Min Ju Kim; Michael J Triolo MD; Cristina H Hajdu MD; Andrew B Rosenkrantz MD

PURPOSE
Size of hepatocellular carcinoma (HCC) is a critical feature in determining liver transplant allocation. The purpose of this study was to compare measurements of size of HCC on different MRI sequences with pathologic size of HCC determined from evaluation of liver explantation specimens.

METHOD AND MATERIALS
92 patients with HCC who underwent contrast-enhanced liver MRI between July 2005 and June 2012 within 90 days before liver transplantation were included in this retrospective study. One radiologist reviewed the imaging in conjunction with pathologic findings and created a map depicting the location of the dominant lesion in each case. Then, two separate abdominal radiologists (R1 and R2) used these maps to independently measure the size of the dominant HCC on the following sequences in different sessions: T2-weighted imaging (T2WI); b-500 diffusion weighted imaging (DWI); and arterial (AR), portal venous (PV) and equilibrium (EQ) post-contrast phases. Size measurements on the various MRI sequences were compared with explant measurements using Pearson’s correlation coefficients, paired T-tests, and Bland-Altman plots.

RESULTS
For R1, correlation with pathology was highest for PV (r = 0.89) and EQ (r = 0.83); for R2, correlation was highest for AR, PV, and EQ (r = 0.85-0.86). Absolute error was lowest for R1 on PV (4.3 mm, p < 0.05). When considering absolute and systematic error, we suggest use of portal venous phase images to obtain the most reliable measurements of size of HCC on MRI. Measurements on arterial phase images systematically over-estimated lesion size for both readers in our study.

CLINICAL RELEVANCE/APPLICATION
HCC size is critical for determining transplant eligibility and allocation. Our findings regarding the utility of size measurements in the portal venous phase may help standardize such measurements.

SSC05-09 Clinical Utility of Weighted Liver Spleen Contrast Using Gadoxetate Disodium-enhanced Hepatic MRI: Pre-evaluation of Stereotactic Body Radiotherapy for Hepatocellular Carcinoma

Yuko Nakamura MD (Presenter); Tomoki Kimura PhD; Fumina Tatsugami; Yasushi Nagata MD; Kazuo Awa MD

PURPOSE
Stereotactic body radiotherapy (SBRT) is a loco-regional therapy for hepatocellular carcinoma (HCC). Radiotherapy to the liver must be
planned carefully because of poor hepatic radiation tolerance especially in HCC patients with liver dysfunction and their eligibility for SBRT for HCC must be assessed carefully because radiation-induced liver disease can be fatal. At SBRT for HCC, V20, defined as the percentage of the liver volume exposed to >20 Gy, is usually planned to be 10%.

**METHOD AND MATERIALS**

We retrospectively studied 18 HCC patients who underwent SBRT; the dose was 48 Gy delivered in 4 fractions. We measured the signal intensity of the liver parenchyma during the hepatobiliary phase in a circular region of interest by referring to a dose distribution map and calculated the liver-spleen contrast (LSC) ratio for each radiation dose area. Then we calculated the weighted LSC (W-LSC) as W-LSC = (mean LSc0-30Gy x liver volume30Gy + mean LSc30Gy x liver volume30Gy) / total liver volume. We divided the patients into groups A (no change in the Child Pugh score 6 months post-SBRT) and B (increased Child Pugh score 6 months post-SBRT) and compared the W-LSC and V20 in the groups. We also calculated the optimal W-LSC cut-off value for predicting liver function transit using receiver operating characteristic analysis.

**RESULTS**

Of the 18 patients 13 were in group A and 5 in group B. There was no significant difference in V20 between the groups (10.36% vs 16.45%, p=0.15); in one patient it was below 10%. There was also no significant difference in W-LSC (1.81 vs 1.47, p=0.22), however, in all group B patients it was below 2.0. At the optimal cutoff value for W-LSC (1.98), sensitivity and specificity for predicting liver function transit were 100% and 61.5%.

**CONCLUSION**

W-LSC may be a more useful quantitative parameter than V20 for predicting liver function transit.

**CLINICAL RELEVANCE/APPLICATION**

The value of W-LSC should be evaluated before SBRT to avoid radiation-induced liver disease.

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### Gastrointestinal (Oncology: Surveillance and Tumor Response)

**Monday, 10:30 AM - 12:00 PM **  
E451A

**SSC06-02 • Validation of Best Surrogate Markers of DCE-US to Predict PFS for Different Anti-angiogenic Treatments**

**Nathalie B Lassau**, MD (Presenter) *; **Michele Kind**, MD; **Valerie Vilgrain**, MD; **Joelle Lacroix**, MD; **Sophie Taieb**, MD; **Serge Koscielny**, MD

**PURPOSE**

To determine retrospectively, in patients with liver metastases, the best predictor for response and survival to transarterial radioembolization (TARE) comparing multi-phase CT, perfusion CT, and 99mTc-MAA SPECT.

**METHOD AND MATERIALS**

Forty consecutive patients (mean age 61 years) with liver metastases undergoing multi-phase CT, CT perfusion and 99mTc-MAA SPECT were included, who all underwent TARE with 90Yttrium microspheres. Arterial perfusion (AP) acquired from perfusion CT, HU values from arterial phase (aHU) and portal venous phase from multi-phase CT, and 99mTc-MAA uptake ratio from SPECT were calculated. Morphologic response was evaluated 4 months after TARE based on RECIST 1.1 criteria. One-year survival was calculated with Kaplan-Meier survival curves, Cox proportional hazard model was used to determine predictors of survival.

**RESULTS**

We found significant differences between responders and non-responders for AP from perfusion CT (38 ± 15 ml/100ml/min vs 12 ± 6 ml/100ml/min, P=0.01) higher one-year survival (mean survival 345 days vs 205 days), whereas an aHU value >55HU did not result in a statistically significant difference in survival (P=0.123). Cox proportional hazard model revealed AP as the only significant (P=0.004), independent predictor of survival.

**CONCLUSION**

Compared to arterial and portal-venous enhancement as well as to the 99mTc-MAA uptake-ratio of liver metastases, the AP from CT perfusion is the best predictor for morphologic response and one-year survival to TARE.

**CLINICAL RELEVANCE/APPLICATION**

Perfusion CT can be used to differentiate between patients most likely to respond to transarterial radioembolization.

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**SSC06-01 • Multimodality Multimparametric Imaging for Prediction of Response and Survival after Radioembolization of Liver Metastases**

**Fabian Morsbach** (Presenter) ; **Bert-Ram Sah**; **Niklaus G Schaefer** MD; **Thomas Pfammatter** MD; **Caecilia S Reiner** MD; **Hatem Alkadhi** MD

**PURPOSE**

To determine prospectively, in patients with liver metastases, the best predictor for response and survival to transarterial radioembolization (TARE) comparing multi-phase CT, perfusion CT, and 99mTc-MAA SPECT.

**METHOD AND MATERIALS**

Forty consecutive patients (mean age 61 years) with liver metastases undergoing multi-phase CT, CT perfusion and 99mTc-MAA SPECT were included, who all underwent TARE with 90Yttrium microspheres. Arterial perfusion (AP) acquired from perfusion CT, HU values from arterial phase (aHU) and portal venous phase from multi-phase CT, and 99mTc-MAA uptake ratio from SPECT were calculated. Morphologic response was evaluated 4 months after TARE based on RECIST 1.1 criteria. One-year survival was calculated with Kaplan-Meier survival curves, Cox proportional hazard model was used to determine predictors of survival.

**RESULTS**

We found significant differences between responders and non-responders for AP from perfusion CT (38 ± 15 ml/100ml/min vs 12 ± 6 ml/100ml/min, P=0.01) higher one-year survival (mean survival 345 days vs 205 days), whereas an aHU value >55HU did not result in a statistically significant difference in survival (P=0.123). Cox proportional hazard model revealed AP as the only significant (P=0.004), independent predictor of survival.

**CONCLUSION**

Compared to arterial and portal-venous enhancement as well as to the 99mTc-MAA uptake-ratio of liver metastases, the AP from CT perfusion is the best predictor for morphologic response and one-year survival to TARE.
CONCLUSION
DCE-US is the first functional imaging technique that validated predictors of tumor progression in a large multicentric cohort.

CLINICAL RELEVANCE/APPLICATION
A large multicentric study confirms the potential of DCE-US to monitor different anti-angiogenic treatments in different type of tumors.

SSC06-03 • Acoustic Radiation Force Impulse Elastography for the Prediction of Chemotherapeutic Response in the Patients with Liver Metastases from Colon Cancer

Jae Young Lee MD (Presenter); Soo Yeon Kang; Se Hyung Kim; Joon Koo Han MD; Byung Ihn Choi MD, PhD *

PURPOSE
To investigate if and when acoustic radiation force impulse (ARFI) elastography can predict chemotherapeutic response in patients with liver metastasis from colon cancer.

METHOD AND MATERIALS
The institutional review board approved this prospective study and informed consents were obtained in all patients. 45 untreated metastatic liver tumors from colon cancer (mean, 3.6 ± 1.9 cm; =3 nodules per patient) were observed in all patients. ARFI elastography was performed before chemotherapy and 48 hours, 1 week, 2 weeks and 4 weeks after chemotherapy for the same liver tumors along with measurement of tumor diameter. Elasticity was calculated from the center, 12 o'clock, 3 o'clock, 6 o'clock and 9 o'clock direction within a tumor, two times per measurement point (total, 10).

RESULTS
Responders (n=10) showed significant drop in elasticity of metastatic liver tumors between pre-chemotherapy and post-48hr (mean difference, -0.23 m/s; 95% CI, -0.42 to -0.04 m/s) (P=0.016). There was no significant interval change between pre-chemotherapy and other time points in responders. No significant interval change between pre and any time points in nonresponders (n=16) was noted. Rather, elasticity in liver tumors in nonresponders increased 48 hours after chemotherapy (mean difference, 0.08m/s; 95% CI, -0.21 to 0.39 m/s) (P=0.54).

CONCLUSION
ARFI elastography might be used as a biomarker to predict chemotherapeutic response as early as 48 hours after initiation of chemotherapy in patients with colon cancer liver metastasis.

CLINICAL RELEVANCE/APPLICATION
ARFI elastography might be used as a biomarker to predict chemotherapeutic response as early as 48 hours after initiation of chemotherapy in patients with colon cancer liver metastasis.

SSC06-04 • Diagnosis of Complete Response in the Colorectal Cancer Liver Metastasis (CRCLM) after Chemotherapy: Which Imaging Modality Should Be Used?

Min Jung Park (Presenter); Mi-Suk Park MD; Seong Ho Park MD *; Won Jae Lee MD; Min Ju Kim; Sung Eun Rha MD; Chang Hee Lee MD; Yoon Jin Lee MD; Sumi Park; Yang Shin Park MD; Nurhee Hong MD

PURPOSE
To compare the accuracy of CT and MRI with liver-specific contrast agent for the evaluation of complete response in CRCLM after chemotherapy in a retrospective multicenter setting and to find out alternative role of non-contrast enhanced MRI (NE-MR) with Diffusion-weighted imaging (DWI) for the evaluation of complete response in CRCLM after chemotherapy.

METHOD AND MATERIALS
Among patients treated for CRCLM between 2008 and 2011 at eight hospitals in Korea, 90 patients (63 men, 27 women; mean age, 57 years; age range, 36-77 years) with the following criteria were retrospectively included: fewer than 10 liver metastases (LM) before chemotherapy; neoadjuvant chemotherapy followed by liver resection; disappearance of at least one LM on post-chemotherapy multidetector CT portal venous phase images with slice thickness=3mm; post-chemotherapy gadoxetic acid-enhanced MRI including DWI of b-value=500sec/mm²; time interval=4weeks between post-chemotherapy CT and MRI; follow-up at least 1 year after surgery. We retrospectively evaluated 445 LM in these patients on CT and MRI. Pathologic report of surgical specimen, sonographic finding on radiofrequency ablation and follow-up CT or MRI were served as reference standard. The diagnostic accuracies of MRI and CT were determined and compared using the McNemar test.

RESULTS
In diagnosing complete response after chemotherapy, gadoxetic acid-enhanced MRI showed significantly higher accuracy (89%), sensitivity (75%), and specificity (94%) compared to CT (59%; 91%; 49%), respectively (P<0.001). MRI with liver-specific contrast agent is more accurate than CT for the evaluation of complete response in CRCLM after chemotherapy. And NE-MR with DWI could be an alternative tool as it is more accurate than CT.

CONCLUSION
MRI with liver-specific contrast agent is more accurate than CT for the evaluation of complete response in CRCLM after chemotherapy.

CLINICAL RELEVANCE/APPLICATION
MRI with liver-specific contrast agent and diffusion weighted imaging is more accurate than CT for the evaluation of complete response in colorectal cancer liver metastasis after chemotherapy.

SSC06-05 • Formula-based Lesion Volume Estimation: Evaluation of the Agreement with Software-based Volumetry

Melvin D'Anastasi MD (Presenter); Ruediger P Laubender MA, MPH *; Julia Lynghjem *; Volker Heinemann MD *; Maximilian F Reiser MD; Anno Graser MD *

PURPOSE
To evaluate the agreement between true tumor volume and tumor volume derived from (i) a new formula based on longest lesion (RECIST) diameter, (ii) a new formula based on longest diameter and longest orthogonal (WHO) diameter.

METHOD AND MATERIALS
89 baseline and follow-up CTs were available in 20 patients with metastatic colorectal cancer from the randomized phase II multicenter CIOX trial. Target lesions were defined at baseline and followed over time. Lesions were evaluated by (i) semi-automated volumetry using Siemens Syngo.via and (ii) volumetric assessment using a newly developed formula based on manual measurement of the longest diameter and the longest orthogonal diameter. True, WHO- and RECIST-based volumes were calculated. We compared the agreement of the true volume to the WHO-based volume and RECIST-based volume. We also compared the agreement between true and WHO-based volume relative changes by means of the intraclass correlation.

RESULTS
A total of 151 lesions were evaluated. Using a variance components model it was shown that the difference between true and RECIST-based volume is statistically significant (p < 0.001) indicating a substantial constant bias. The same model showed a difference between true and WHO-based volume, which was not statistically significant (p = 0.50), indicating no substantial constant bias. Scatter-plots show that the RECIST-based volume overestimates lesion volume. The intraclass correlation between true and WHO-based volume relative changes was 0.95, showing nearly perfect agreement between methods.
CONCLUSION
Our proposed formula, if based on WHO-measurements, allows for a very good estimate of relative volume changes (the RECIST-based formula overestimates the true volume).

CLINICAL RELEVANCE/APPLICATION
Volumetric tumor information, in particular relative changes in volume during therapy, can be approximated using the proposed WHO-based formula if no volumetric software is available.

SSC06-06 ● Novel Diffusion Kurtosis Imaging for Improved Evaluation of Treatment Response of Hypervascular Hepatocellular Carcinoma
Satoshi Goshima MD, PhD (Presenter); Yoshifumi Noda MD; Hiroshi Kondo MD; Hiroshi Kawada MD; Haruo Watanabe MD; Masayuki Kanematsu MD; Yukichi Tanahashi MD; Nobuyuki Kawai MD; Kyongtae T Bae MD, PhD *

PURPOSE
To determine the value of diffusion kurtosis imaging (DKI) of the liver for improved evaluation of treatment response of hypervascular hepatocellular carcinoma (HCC).

METHOD AND MATERIALS
During a five-month period, we prospectively recruited 62 patients with treated or untreated hypervascular HCC (48 men and 14 women; mean age, 73.4 years; range, 49-86 years) and evaluated their MR images. DKI was performed with a respiratory-triggered single shot echo-planar sequence at multiple b values (0, 100, 500, 1000, 1500, and 2000 sec/mm²). The duration of this imaging acquisition was five minutes. We computed the mean kurtosis (MK) and apparent diffusion coefficient (ADC) (10⁻³ mm²/s) over regions of interest encompassing the entire tumor using MATLAB software (Mathworks, Natick, Mass). The diagnostic performance of MK and ADC values for the evaluation of HCC viability were compared.

RESULTS
MR image acquisition and analysis were successful in all our study patients. Forty-nine HCCs were completely necrotic: 10 after transcatheater arterial chemoembolization (TACE) and 39 after radiofrequency ablation (RFA), whereas 22 HCCs revealed local recurrences: 18 after TACE and 4 after RFA. On the other hand, 41 HCCs remained untreated. MK was significantly higher in the untreated and local recurrent HCCs (0.81 +/- 0.11) than the necrotic HCCs (0.57 +/- 0.11) (P < 0.001). Mean ADC value was significantly lower in the untreated and local recurrent HCCs (1.44 +/- 0.42) than the necrotic HCCs (1.94 +/- 0.52) (P < 0.001). For the evaluation of HCC viability comparing between the MK and ADC, the sensitivity, specificity, and area under the ROC curve for the MK (85.7%, 98.0%, and 0.95; cutoff value of 0.710) were greater than those of the ADC (79.6%, 68.3%, and 0.77; cutoff value of 1.535).

CONCLUSION
Our study findings suggest DKI is superior to conventional diffusion MRI analysis for the evaluation of posttherapeutic response of HCC.

CLINICAL RELEVANCE/APPLICATION
When MRI is performed to evaluate the posttherapeutic response of HCC, diffusion kurtosis imaging may improve the diagnostic confidence of lesion characterization over conventional diffusion imaging.

SSC06-07 ● Heterogeneity Analysis of Tumor Perfusion for Monitoring Antiangiogenic Therapy in Hepatocellular Carcinoma Using Fractal Analysis
Koichi Hayano MD (Presenter); Sang Ho Lee PhD; Hiroyuki Yoshida PhD *; Dushyant V Sahani MD

PURPOSE
Noninvasive imaging biomarkers that can quantitatively monitor physiologic changes in tumor microenvironment in response to antiangiogenic therapies will be of significant value. No in vivo study showed whether antiangiogenic agents can change the heterogeneity of tumor blood physiology. The purpose of this study is to evaluate the change of heterogeneity in tumor perfusion during antiangiogenic therapy using fractal dimension analysis in hepatocellular carcinoma patients treated with bevacizumab.

METHOD AND MATERIALS
Twenty-three patients (15 men, 8 women; mean age: 61.0 years) with advanced HCC underwent CT perfusion (CTP) at baseline and 2 weeks after administration of bevacizumab. Perfusion color maps of blood flow (BF) generated by the perfusion software (CT Perfusion 3; GE) were saved in a grayscale format, and were loaded onto ImageJ (NIH), and fractal analyses were applied to perfusion maps using a plugin ImageJ software (FracLac, version 2.5). Differential box count method was applied, and fractal dimension and lacunarity were calculated as heterogeneity parameters. The baseline and percent change of heterogeneity parameters were compared with clinical response and PFS at 6 months.

RESULTS
This study included 12 clinical responders and 11 non-responders. 11 patients were PFS > 6 months, whereas 12 were PFS.

CONCLUSION
Fractal analysis demonstrated that a patient whose BF heterogeneity in tumor was improved during antiangiogenic therapy could show a longer PFS. Homogenization of blood physiology may reflect an important process in normalization of tumor vasculature during antiangiogenic treatment.

CLINICAL RELEVANCE/APPLICATION
Fractal analysis of CT perfusion can be a new noninvasive biomarker for antiangiogenic therapy.

SSC06-08 ● Significance of Pelvic Imaging in Computed Tomographic Surveillance of Hepatocellular Carcinoma
Kazim Narsinh MD (Presenter); Iris M Otani MD; Cynthia S Santillan MD; Claude B Sirlin MD *

PURPOSE
To retrospectively determine the frequency and clinical significance of the findings and recommendations derived from pelvic CT performed as part of multiphasic CT surveillance imaging for hepatocellular carcinoma (HCC) in patients at risk for the development of HCC.

METHOD AND MATERIALS
The study was HIPAA-compliant and approved by the institutional review board with waiver of informed consent. The cohort was comprised of 602 patients with either cirrhosis and/or hepatitis B who were referred for routine HCC surveillance by hepatologists from an academic medical center in southern California. Multiphasic acquisitions were performed using a multilayer 16-slice or 64-slice helical CT scanner (GE Lightspeed) to obtain non-contrast, arterial, portal venous, and delayed phase images. Reports from the initial abdominalpelvic CT scan for each patient obtained between 2002-2007 were retrospectively reviewed for extrahepatic findings in the pelvis.

RESULTS
Screening was performed in 602 patients (mean age 54 years). Of these patients, 389 (65%) were male and 213 (35%) were female. Logistic regression indicated a lower likelihood of pelvic findings in patients that were young (CONCLUSION
Pelvic CT included at the time of HCC surveillance does not uncover a statistically significant number of incidental pelvic findings that impact patient care. In light of the increased ionizing radiation dose to patients and unnecessary healthcare costs associated with pelvic CT imaging in this context, routine surveillance of patients with known risk factors for HCC should be performed with multiphasic abdominal CT only.
Vascular/Interventional (Chemoembolization)

Monday, 10:30 AM - 12:00 PM • E351

SSC16 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator
S. William Stavropoulos, MD *

Moderator
Kenneth J Kolbeck, MD, PhD

SSC16-01 • Influence of Hepatic Artery Embolization on Tumor Growth and Metastatic Potential in a Rat Orthotopic Hepatoma Model

Guang Zhi Wang, PhD, MD (Presenter) ; Zhu Ting Fang ; Wei Zhang ; Jianhua Wang

PURPOSE
To examine if transarterial embolization (TAE) enhance the metastatic potential of the residual HCC, and investigate the mechanisms underlying the effects of embolization with a rat model of orthotopic hepatocellular carcinoma.

METHOD AND MATERIALS
All protocols were approved by the animal research committee of Fudan University and met NIH guidelines. In vitro study, the hepatoma cell line McA-RH7777 marked by GFP (Green Fluorescent Protein) were cultured under hypoxic and normoxic conditions. Forty male buffalo rats were implanted with McA-RH7777 tumor in the left lateral lobe of liver. After laparotomy and retrograde placement of catheter into the gastroduodenal artery (14 days after implantation), TAE used with lipiodol (0.2 ml/kg) were performed. Tumor volumes were measured before (on day 14) and after (on day 28) treatment with magnetic resonance imaging (MRI). Tumor growth and lung metastases were further observed using fluorescence imaging and the macroscopic characteristics were correlated with histological findings. The migration and invasion of HCC was observed by invasion assays in vitro. The molecular changes of hypoxia-inducible factor (HIF)-1α, VEGF, E-cadherin, N-cadherin, and vimentin in residual tumor cells were evaluated by western blot, PCR, or immunohistochemistry in vitro and in vivo respectively. The Mann-Whitney U-test or 22 was used for statistical comparisons.

RESULTS
In vitro invasion assay indicated that the numbers of invading hypoxic McA-RH7777 cells were 30.8±4.74, which were significantly higher than normoxic cells (10.3±3.59, P < .05). Successful implantation was achieved in all rats, which was confirmed by MRI. The metastatic potential of tumor cells by hypoxia or interventional procedure was enhanced by significantly reducing the expression of E-cadherin and up-regulation of HIF-1α, VEGF, E-cadherin, N-cadherin, and vimentin in residual tumor cells were evaluated by western blot, PCR, or immunohistochemistry in vitro and in vivo respectively. The Mann-Whitney U-test or 22 was used for statistical comparisons.

CONCLUSION
Hypoxia always occurring residual tumor after the TAE can increase invasiveness and metastatic potential of HCC, and targeting to the molecular changes induced by hypoxia may augment the therapeutic effects of TAE.

CLINICAL RELEVANCE/APPLICATION
The study may help to design of mechanism-based combination therapies or new therapeutic regimes to improve the effect of TACE in the clinical treatment of HCC.

SSC16-02 • Bimodal Treatment of Aerobic and Glycolytic Metabolism by Particle Embolization Combined with Anti-glycolytic Compound Improves Treatment of N1-S1 Hepatocellular Mouse Model

John R Haaga, MD (Presenter) ; Hanping Wu, MD, PhD

PURPOSE
To determine if combination treatment of aerobic metabolism by embolization and antiglycolytic drugs compared to embolization alone provides better treatment of N1-S1 hepatocellular carcinoma in a rat model.

METHOD AND MATERIALS
Two separate laparotomies were performed, one for subcapsular tumor implant and the second for retrograde placement of catheter into the gastroduodenal artery for 5 different treatments. Treatments were: 1) Control (n=5, 1 ml NS); 2) TAE (n=4, 10mg 50-150μm PVA particle in 1 ml NS), 3) TAE+AG-B (n=5, 10mg PVA in 1 ml AG-B); 4) TAE+AG-F (n=5, 10mg PVA+30mg AG-F in 1 ml NS); 5) TAE+AG-C (n=5, 10mg PVA+30mg AG-C in 1 ml normal saline). Tumor length (L), width (W), and height (H) was measured by 2D-ultrasound before treatment and twice a week till 4 weeks after treatment. Tumor volume (V) was calculated by the formula: V = 0.5*L*W*H. Relative tumor volume after treatment was calculated as the percentage of pre-treatment tumor volume. Kruskal-Wallis test was used to compare the difference of relative tumor volume between 5 groups on each observation time point.
RESULTS

The initial tumor sizes in each group were statistically not significantly different. Three animals in the control group were euthanized before the end of observation due to rapid tumor growth and anorexia. In TAE group, one kept growing after treatment. In other 3 animals, the tumor volumes increased in the early observation time points (1 within 1 week, 2 within 2 weeks) and then shrank. In other 3 TAE+AG groups, the tumor volumes decreased after treatment with significant differences between control group and 3 TAE+AG groups on all observation time point except TAE+AG-F group on 3.5 and 4 weeks. At 4 weeks after treatment, the median relative tumor volumes were 3.174.5% in control group, 5.82% in TAE group, 9.6% in TAE+AG-B group, 23.8% in TAE+AG-F group, and 13.4% in TAE+AG-C group.

CONCLUSION

Bimodal embolic treatment of hepatocellular cancer is more effective than embolic Rx alone. Further study of these propriety agents is warranted because agents target enzymes specific to cancer. Optimization of drug form, dose and route administration (IV, oral) are needed. Safety studies must be completed before human use.

CLINICAL RELEVANCE/APPLICATION

Clinical relevance is enormous. Agents should be effective against all cancers with little effect on normal tissues. Mode of delivery can be arterial, intravenous and/or oral. Challenge is funding.

SSC16-03 • Effects on Apoptosis in Rabbit Hepatic VX2 Carcinoma after Transcatheter Arterial Chemoembolization Using Alginate Microspheres-Adriamycin (ADM): Experimental Study

Kaiyuan Xu (Presenter)

PURPOSE

To evaluate effects on the apoptosis of transcatheter arterial chemoembolization (TACE) with alginate microsphere-adriamycin in experimentally induced liver tumor.

METHOD AND MATERIALS

Thirty New Zealand White rabbits were randomly divided into five groups and VX2 carcinoma was grown in the left lobes of the livers. TACE was performed with normal saline (Group A), alginate microsphere (Group B), alginate microsphere-adriamycin (Group C), Lipiodol (Group D), and Lipiodol-adriamycin (Group E). Three weeks later, the animals were killed and apoptotic index were calculated on the basis of findings. Effects on intrahepatic and distal metastasis in all groups were examined.

RESULTS

CONCLUSION

Alginate microspheres can potentially serve as embolizing agents and drug delivery vehicles for slow release. With embolization and chemotherapy effect of doxorubicin, alginate microspheres induce and promote apoptosis of tumor cells, which reduce residual areas of tumor, the recurrence rate and metastasis rate.

CLINICAL RELEVANCE/APPLICATION

Chemoembolization with Alginate microsphere-ADM is an effective antitumor treatment of hepatic carcinoma.

SSC16-04 • Evaluation of a Combined Protocol of Sorafenib and Transarterial Chemoembolization (TACE) vs. TACE vs. Sorafenib Protocol Alone in Advanced Stage Hepatocellular Carcinoma (HCC): Retrospective Study at Three German Liver Centers

Thomas J Vogl MD, PhD (Presenter) ; Jorg Trojan MD ; Markus Goller ; Mark Op Den Winkel ; Eckart Schott ; Martin W Welker ; Stefan Zangos MD ; Wolf-Otto Bechstein ; Stefan Zeuzem MD ; Frank T Kolligs MD

PURPOSE

To compare combined Sorafenib and transarterial chemoembolization (TACE) with TACE alone and Sorafenib alone for treatment of patients with advanced hepatocellular carcinoma (HCC) according to the Barcelona Clinic Liver Cancer (BCLC) stage C.

METHOD AND MATERIALS

In this retrospective multicenter cohort study 185 patients with BCLC stage C who were treated with Sorafenib and TACE (group A, n=50), with TACE alone (group B, n=59) or with Sorafenib alone (group C, n=76) were retrospectively analyzed for comparison from January 2007 to October 2012. Portal vein infiltration, extrahepatic metastases, time-to-progression and overall survival were evaluated. For patients of group A adverse events were also documented.

RESULTS

Portal vein infiltration was documented in 32% of patients in group A, 36% in group B, and 37% in group C. Extrahepatic metastases were present in 60% (group A), 34% (group B), and 49% (group C). Median time-to-progression was 6.3 months in group A (95%-CI: 13.8-20.5), 11.0 months in group B (95%-CI: 8.1-13.9) and 9.0 months in group C (95%-CI: 7.0-11.0). The most common adverse events in the combined treatment of Sorafenib and TACE were diarrhea (54%), hand-foot-skin reactions (40%) and fatigue (36%). Due to adverse events the Sorafenib dose was reduced in 86% of patients in group A and stopped in 6%.

CONCLUSION

The combined treatment of Sorafenib and TACE seems to be a promising treatment option in patients with HCC in BCLC stage C, especially if extrahepatic metastases are present. However, further prospective or randomized studies are necessary.

CLINICAL RELEVANCE/APPLICATION

The combined therapy of Sorafenib and TACE is a relevant therapy option for patients in advanced stages of HCC.

SSC16-05 • Quantitative Measurement of the Hepatic Blood Flow before and after Transcatheter Arterial Chemoembolization of Hepatocellular Carcinoma

Yi-Yang Lin MD (Presenter) ; Rheun-Chuan Lee MD ; Hsiuo-Shan Tseng ; Chien An Liu MD ; Wan-Yuo Guo MD, PhD * ; Cheng-Yen Chang MD

PURPOSE

To quantitatively measure the hemodynamic change of hepatic artery before and after transcatheter arterial chemoembolization (TACE) of hepatocellular carcinoma (HCC) by quantitative color-coding analysis (QCA).

METHOD AND MATERIALS

This prospective study was performed from December 2012 to February 2013. 64 patients (mean 67.5 year old; male 50, female 14) who were diagnosed with HCC and underwent TACE with doxorubicin and lipiodol emulsion or with microspheres were enrolled if superselective segmental TACE was technically feasible. The endpoint of TACE was sluggish of antegrade arterial flow. QCA (syngo iFlow; Siemens) was used to determine the maximal density time (Tmax) of selected intravascular region of interest (ROI). Relative Tmax (rTmax) was defined as the Tmax at the selected ROI minus the time of contrast medium spurring from the catheter tip. The catheter tip was placed in common hepatic artery, proper hepatic artery or lobar hepatic arteries before and after TACE with the same acquisition and injection protocols. The rTmax of treated and proximal hepatic arteries were analyzed before and after embolization.

RESULTS

The pre- and post-treatment rTmax of the landmarks at the treated segmental artery and proximal right hepatic artery were 1.84~2.08s,
QCA is feasible to quantify embolization endpoint by comparing the rTmax in selected hepatic arteries before and after TACE. The rTmax of treated segmental artery was significant prolonged after optimized procedures.

CONCLUSION
QCA is able to quantitatively determine the adequate embolization endpoint in HCC patients.

**SSC16-06 • Does Safety Margin Reduce Local Recurrence in C-arm CT-assisted Chemoembolization for Small Nodular Hepatocellular Carcinoma?**

**Hyo-Jin Kang (Presenter) ; Jin Wook Chung MD * ; Hyo-Cheol Kim MD ; Hwan Jun Jae MD ; Saebom Hur MD**

**PURPOSE**
To test the hypothesis that safety margin may reduce local recurrence in superselective chemoembolization for small nodular hepatocellular carcinoma (HCC).

**METHOD AND MATERIALS**
To test the hypothesis, the consecutive patients who underwent both C-arm CT assisted superselective chemoembolization using an iodized oil for small nodular (1-3cm in size and 3 or less in number) HCC as the initial treatment and immediate thin-section iodized-oil CT were identified from the prospectively registered electronic database. From March 2009 to March 2011, 96 nodules in 80 patients (60 men, 20 women; mean age, 61.5 years) were included in this study. On immediate iodized-oil CT, we analyzed the presence or absence of defect in iodized-oil uptake in the tumor and completeness of safety margin in the surrounding liver parenchyma. Univariate and multivariate analyses were performed to determine prognostic factors for local recurrence. Potential determinant factors included Child-Pugh class, tumor size, tumor vascularity, definition of tumor boundary, tumor depth from surface to hilum, selectivity of chemoembolization, pattern of oily portogram, lipiodol uptake intensity, and lipiodol uptake homogeneity.

**RESULTS**
The median follow-up time was 26.4 months (range, 1-46.1 months). 37 nodules in 33 patients showed local recurrence. 1- and 2-year cumulative local recurrence rates were 61.9% and 81%, 9.3% and 20.2% for nodules with defect (n=21) and for nodules without defect (n=75), respectively (p=.000). Among the 75 nodules without defect, 1- and 2-year cumulative local recurrence rates were 11.1% and 22.2%, 7.7% and 17.9% and for nodules with complete safety margin (n=36) and for nodules with incomplete safety margin (n=39), respectively (p=.901). In multivariate analyses using Cox proportional hazard model, lipiodol uptake homogeneity (HR = 0.266; 95% CI: 0.11, 0.65; P < .05), lipiodol uptake defect (HR = 3.76; 95% CI: 1.53, 9.27; P < .05) remained significant in local recurrence.

**CONCLUSION**
In case of complete lipiodol uptake in the tumor, safety margin did not affect local recurrence rate in C-arm CT assisted chemoembolization for HCC.

**CLINICAL RELEVANCE/APPLICATION**
In case of complete lipiodol uptake in the tumor, additional effort to ensure complete safety margin as in RF ablation is not justified in superselective chemoembolization for small nodular HCC.

**SSC16-07 • Volumetric Tumor Assessment Predicts Survival in Patients Treated with Transarterial Chemoembolization for Hepatocellular Carcinoma**

**Vania Tacher MD (Presenter) ; Mingde Lin PhD * ; Nikhil Bhagat MD ; Constantine Frangakis ; Hooman Yarmohammadi MD * ; Rafael Duran MD ; Michael Chao ; Rongxin Chen ; Zhijun Wang MD ; Jean-Francois H Geschwin MD * ;**

**PURPOSE**
Tumor response in patients with hepatocellular(HCC) treated by transarterial chemoembolization(TACE) can be measured quantitatively using 3D quantitative European Association for the Study of the Liver (qEASL) and volumetric Response Evaluation Criteria in Solid Tumor (vRECIST). The purpose of this study was to demonstrate that qEASL and vRECIST can be used to predict patient survival.

**METHOD AND MATERIALS**
Tumor response using pre and post TACE MRI was assessed on 84 consecutive patients treated with a first session of TACE for HCC. The entire tumor volume was used for vRECIST and the enhancing portion of the tumor volume for qEASL analysis. Targeted tumor response (TTR) and overall tumor response (OR) revealed two distinctive groups of patients: responder (R) and non-responder (NR). For TTR using vRECIST, R was defined as patients with a decrease sum of target tumor (TT) volumes beyond 30%. For TTR using qEASL analysis, R was defined as patients with a decrease, beyond 50%, of the sum of TT qEASL volume. vRECIST and qEASL OR were determined based on TTR, non-TTR and on potential new lesion on post-TACE MRI. Survival difference between R and NR for TTR and OR as defined by vRECIST and qEASL were explored by Kaplan Meier survival analysis.

**RESULTS**
131 TT, 32 non-TT and 9 new lesions were evaluated from 84 HCC patients. Mean tumor volume and mean enhancing volume decreased from 235±475cm3 and 206±414cm3 to 120±250cm3 and 97±215cm3, respectively. Using vRECIST, both TTR and OR showed n=8(10%) R with a mean survival time of 45±18 months, and n=76(90%) NR with a mean survival time of 27±3 months. There was no statistical survival difference between R and NR for vRECIST TTR and OR (P=0.177). According to qEASL analysis, both TTR and OR showed n=30(36%) R and n=54(64%) NR. Mean survival times based on qEASL TTR was 42±4 months for R and 23±3 months for NR. qEASL TTR and OR analysis showed that survival times between R and NR were statistically different with p= 0.014 and p=0.018, respectively.

**CONCLUSION**
The 3D tumor enhancement assessment, qEASL can be used to assess target tumor response and overall tumor response and can predict survival in HCC patients after the first TACE session.

**CLINICAL RELEVANCE/APPLICATION**
3D tumor enhancement assessment model can be used to assess target tumor response and overall tumor response and predict survival in HCC patients after the first TACE session.

**SSC16-08 • Assessing Viable Tissue within Hepatocellular Carcinoma (HCC) Lesions after Locoregional Therapy: A Comparison between Modified RECIST (mRECIST) and Volumetric Quantification**

**Fernanda D Gonzalez Guindalini MD * ; Adeel R Seyal MD (Presenter) * ; Marcos P Botelho MD * ; Hamid Chalian MD ; Riad Salem MD, MBA * ; Vahid Yaghmai MD * ;**

**PURPOSE**
mRECIST is used to assess HCC response to locoregional therapy. We compared the accuracy of mRECIST to volumetric viable tissue quantification in HCC after locoregional therapy.

**METHOD AND MATERIALS**
This HIPAA compliant retrospective study was IRB approved. Twenty-four HCCs were evaluated in 24 patients by triphasic MDCT scans performed before and three months after 90Y-radioembolization. The percentage of change in viable tissue within the tumor, defined as enhancing areas on arterial phase, was quantified based on mRECIST and volumetrically using segmentation software. Results were compared using the paired t-test, Bland-Altman plots and concordance correlation coefficient. The agreement between the methods in the assessment of treatment response was examined by kappa (k) statistics.
A significant difference in percentage of residual viable tissue was observed between the two methods (P=0.008). There was wide difference in measurements between the methods with a bias of 49.0% (95% CI: -96.9% to 194.9%). Correlation between mRECIST and volumetric measurement was poor, pc=0.54. Poor agreement was demonstrated between the two techniques when assessing response based on percentage of change in viable tissue (k = 0.34, 95% CI: 0.148-0.543).

CONCLUSION
There is poor agreement between mRECIST and volumetric quantification when assessing response to locoregional therapy in HCC.

CLINICAL RELEVANCE/APPLICATION
Necrosis in treated HCC can have heterogeneous distribution. Volumetric quantification of viable tumor demonstrated better agreement between readers and yielded different results compared with mRECIST.

**SSC16-09 • Estimation of the Prognosis of Hepatocellular Carcinoma Treated with Hepatic Arterial Chemoembolization: Comparison of Nine Prognostic Staging Systems**

*Yasutaka Baba MD (Presenter); Sadao Hayashi MD; Shunichiro Ikeda BS; Masayuki Nakajo PhD*

**PURPOSE**
To examine various prognostic staging systems estimating the prognosis of patients with hepatocellular carcinoma (HCC) treated with hepatic arterial chemoembolization (HACE).

**METHOD AND MATERIALS**
The subjects were 1040 patients (Male:714, Female:326) with the mean age of 67.5 (range, 17–93 years) treated with HACE for HCC from January 1990 to December 2009. HACE was mainly done selectively using anticancer drugs mixing with iodized-oil and gelatin sponge. Factors determining survival were analyzed by univariate and multivariate analyses using the Kaplan-Meier method and Cox proportional hazard regression models. Nine prognostic staging systems (Child Pugh classification[CPC], UICC TNM, Japanese Integrated Staging score [JIS], Okuda score [Okuda], Cancer of the Liver Italian Program [CLIP], Barcelona Clinic Liver Cancer [Barcelona], Japanese TNM [JTNM], Japanese Liver Damage[JLD], Tokyo score[Tokyo]) were compared about the discriminatory capacity, which was tested by the linear trend. Moreover, the likelihood ratio test was used to investigate the additional homogeneity of survival within scores.

**RESULTS**
The mean survival period was 33 months. In a multivariate analysis, tumor number (>=4), tumor diameter(>=3cm), vascular invasion (+), ascites (+), albumin(0.5), presence of cirrhosis (F4), were significant predictors of survival. Among 9 prognostic staging systems, CLIP was the most informative prognostic staging system for estimating the long term survival of patients with HCC treated with HACE. Among 9 prognostic staging systems, CLIP may be the most important prognostic system for estimating the prognosis of patients with HCC treated with HACE.

**SUMMARY**

- Estimation of the Prognosis of Hepatocellular Carcinoma Treated with Hepatic Arterial Chemoembolization: Comparison of Nine Prognostic Staging Systems
- There is poor agreement between mRECIST and volumetric quantification when assessing response to locoregional therapy in HCC.
- CLIP was the most informative prognostic staging system for estimating the long term survival of patients with HCC treated with HACE.
Searching for the Source of Infection: Role of Diffusion Weighted Image (DWI)

Nancy A Hammond MD (Presenter); Fernanda D Gonzalez Guindalini MD *; Paul Nikolaidis MD; Frank H Miller MD; Vahid Yaghmai MD

PURPOSE/AIM
This exhibit will review the role of DWI in improving sensitivity and specificity of MR imaging for diagnosing sources of infection in the abdomen.

CONTENT ORGANIZATION
1) Review DWI, its strengths and weaknesses
2) Demonstrate how DWI can improve the sensitivity of searching for the source of fever/infection
3) Illustrate specific cases where DWI increased specificity and diagnostic confidence when searching for an intra-abdominal source of fever (and in several examples was the only sequence suggesting infection), including:
   - Abdominal abscess
   - Acute pyelonephritis and pyonephrosis
   - Acute and chronic inflammatory pelvic diseases
   - Appendicitis
   - Diverticulitis and colitides
   - Cholecystitis
   - Pancreatitis
4) Potential pitfalls will be illustrated

SUMMARY
Diffusion weighted images can help in detection of the source infection in the abdomen and pelvis, improving sensitivity and specificity of MR.

Abdominal CT Perfusion: Breathhold or Free Breathing?

Takeshi Yoshikawa MD *; Tomonori Kanda; Yoshiharu Ohno MD, PhD *; Keitaro Sofue (Presenter); Noriyuki Negi RT; Yasuko Fujisawa MS *; Tohru Murakami; Hisanobu Koyama MD; Mizuho Nishio MD *; Naoki Kanata MD; Kazuro Sugimura MD, PhD *

PURPOSE
To assess effects of breath control technique on CT perfusion values in the abdomen.

METHOD AND MATERIALS
One hundred eight patients (male: 69, female: 39, mean age: 70.6 years) underwent upper abdominal CT perfusion. Scans (0.5mm x 320, 80kV, AEC) were conducted 7 to 120 seconds after administration of contrast medium (CM) and 25-ml saline chaser. The patients were randomly divided into two groups: breathhold and free breathing groups. Demographic features and scan parameters (FOV, TR, and DLP) were recorded and compared. CT images were analyzed using prototype software for perfusion analysis, which also compensated first manually, then automatically for respiratory misregistrations before perfusion analysis. Maximum length of manual compensation (mm) (usually z-direction) was recorded for each patient and compared between the groups. Heparatic arterial and portal perfusion (HAP and HPP, ml/min/100ml), arterial perfusion fraction (APF %), mean transit time (MTT, s), and arterial perfusion volume (DV, ml/100ml) were calculated using dual-input maximum slope (DMS), deconvolution (DDC), and compartment model (DCM) methods using the same ROIs. Arterial perfusions (AP), MTT, and DV of pancreas, spleen, gastric wall were calculated using single-input MS, DC, and CM (sMS, sDC, sCM) methods. The values were compared between the groups.

RESULTS
There was no significant difference in demographic features or scan parameters. Mean manual compensation length had a trend toward larger in free breathing group (13.5 ± 7.7) than breathhold (11.3 ± 7.9). HAP with DCM (p < .05).

CONCLUSION
Even after careful compensations for respiratory misregistrations, CT perfusion values in the liver are affected by breath control technique. Changes in portal perfusion values were possibly due to structure distortions, which made vessel tracking process in analysis difficult. CT perfusion values might be caused by intra-thoracic or inferior vena cava pressure changes.

CLINICAL RELEVANCE/APPLICATION
CT perfusion values in the liver are affected by breath control technique. When measuring hepatic portal perfusion or CM transit time, breathhold technique is recommended.

Chronic Liver Diseases Assessment with Optimized Intra-Voxel Incoherent Motion MRI Protocol at 3.0T

Herve Saint-Jalmes PhD (Presenter); Benjamin Leporq MS; Frank Pilleul MD; Olivier Beuf PhD

PURPOSE
To optimize a 3.0T acquisition protocol for liver Intra-Voxel Incoherent Motion imaging (IVIM) imaging to be included in a clinical study focused on chronic liver diseases.

METHOD AND MATERIALS
First, acquisition protocol was evaluated on 25 healthy volunteers (16 men, 9 women; mean age: 27.1 years; mean weight: 71 kg). Acquisitions were performed on a 3.0T GE Discovery MR 750 (GEHC, Milwaukee, WI, USA) system with 50 mT/m maximum gradient amplitude. Sequence used was the SE-EPI eDWI sequence (enhanced Diffusion Weighted Imaging) including 12 b-factors (0, 10, 20, 40, 60, 80, 100, 200, 300, 400, 600, and 800 s/mm²) with variable NEX according to b-factor (2-2-2-3-3-4-5-6-7-8-9 NEX) with 2000 ms TR and 55 ms TE. All axial slices were acquired with a 400 × 300 mm² FOV, 128 × 96 acquisition matrix, 8 mm slice thickness, and a 250 KHz bandwidth. Fat Sat was disabled. Signal was collected using the 32 channels body coil. Then scan duration was 5-12 ±.

RESULTS
Theoretical optimization based on Cramér-Rao inequality providing optimized b-factors.

CONCLUSION
Minimization study showed that using a limited (4) number of chosen b-factors give the same results compared with 12 b-factors. The use of SmartNex, 3-in-1 diffusion gradient scheme, free breathing technique and only 4 b-factors enabled whole liver Intra Voxel Incoherent Motion Imaging within a minute and seem to be a suitable compromise to be added in a clinical protocol focusing on chronic liver diseases assessment.

CLINICAL RELEVANCE/APPLICATION
Optimized MRI protocol at 3.0T dedicated to liver examination of chronic liver diseases focusing on fibrosis and cirrhosis.

Sigmoid Stenosis Caused by Diverticulitis versus Carcinoma: Can They be Differentiated by Ultrasound?
CONCLUSION

Patients with peritoneal carcinomatosis (PC) cytoreductive surgery combined with hyperthermic intraperitoneal chemotherapy (HIPEC) is an evolving therapeutic approach with curative intention. To differentiate between posttherapeutic findings and relapse of PC is challenging. Due to promising results in the preoperative assessment of PC we evaluated the diagnostic performance of DWI and Eovist MRI in the detection of PC after HIPEC.

METHOD AND MATERIALS

Fifty-two patients with peritoneal carcinomatosis were examined by US and CT during the period February 2006 - January 2013. Immediately after US or CT scans each stenosis was classified as malignant or benign. Off-site, two readers, who were unaware of the proven diagnosis, independently and retrospectively analyzed 13 different morphological ultrasound criteria retrieved from a literature review to differentiate between benign and malignant strictures. The two readers were asked to give a diagnosis of malignant, benign or indeterminate stenosis. Sensitivity, specificity and accuracy were calculated by considering the pathological analysis or by clinical follow up of at least one year. The interobserver agreement was calculated by the kappa statistics.

RESULTS

There were 22 sigmoid carcinomas and 30 diverticulitis. The on-site US results were 93% sensitivity, 96% specificity and 95% accuracy for the colon carcinoma diagnosis; CT sensitivity was 87%. The strongest sensitive morphological features for cancer were loss of normal layer structure (87%), length 15 mm (93%) and absence of diverticula (88%) were the most specific findings for carcinoma. For diverticulitis, the most sensitive and specific criteria were preserved mucosal folds and conservation of the inner layer (90 and 95.5%, respectively). Pericolic fat infiltration or abscess were not good criteria for differentiating them. The agreement on morphologic features oscillated between 0.441 (length 0.8 in 5 out of 13 features. Off-site US diagnosis, excluding 4 indeterminate cases, oscillated between 94-98% of accuracy or 95-100% of sensitivity. The interobserver agreement was 0.782, coinciding in the diagnosis of malignant or benign stenosis in 46 out of 52 cases.

CONCLUSION

Our experience suggests that diverticulitis can often be differentiated from colon carcinoma on the basis of some US findings described in the literature.

CLINICAL RELEVANCE/APPLICATION

It is not possible to perform colonoscopy or CT-colonography to exclude carcinoma in patients with diverticulitis subjected to conservative management until inflammatory changes have subsided.
surgery and HIPEC is significantly reduced regarding the presence of PC at all as well as the extent of PC due to the restricted ability to differentiate between posttherapeutic findings and manifestations of PC.

CLINICAL RELEVANCE/APPLICATION

The diagnostic value of 18F-FDG PET/CT to evaluate the presence and extent of recurring PC after cytoreductive surgery and HIPEC is restricted to preoperative results.

**LL-GIS-MO6A** • Can We Use Hepatobiliary Agents and Eliminate Tissue Diagnosis?

Elizabeth J Sutton MD (Presenter); Richard Kinh Gian Do MD, PhD; Kristen L Zakian; Debra Goldman BS; Nancy Kemeny MD; Michael D’Angelica MD

**PURPOSE**

Among different therapies for colorectal liver metastases (CLM), hepatic arterial infusion (HAI) can deliver high dose chemotherapy with high response rates. However, there is limited ability to predict treatment response before surgery and this would be of obvious value. The purpose of this study was to evaluate CT imaging and clinical predictors of CLM response to combination HAI plus systemic chemotherapy.

**METHOD AND MATERIALS**

A retrospective review of patients with initially unresectable CLM enrolled in an institutional review board approved prospective trial for HAI pump therapy was performed. 54 patients (mean age 59.6, range 33-76; 22 females and 32 males) were included, 51 of whom had available pre and post-treatment contrast enhanced CT scan available for review. Percentage best response (BR) was evaluated according to Response Evaluation Criteria In Solid Tumors (RECIST) during the trial. For each target CLM identified by RECIST, size and mean Hounsfield Unit (HU) attenuation were measured on pre-treatment portal venous phase CT. Clinical parameters including prior systemic chemotherapy and eligibility for post-treatment surgical resection of CLM were documented. Spearman’s rho and Wilcoxon’s Rank Sum test were used for statistical analysis.

**RESULTS**

Before treatment, HU attenuation of CLM was higher in patients who eventually underwent surgical resection (p=0.02), positively correlated with BR (rho=0.33; p=0.02) and negatively correlated with size of CLM (rho=-0.32, p=0.02). No significant correlation was found between pre-treatment size of CLM and BR (rho=-0.09; p>0.05). Size of CLM and HU were not significantly different between those who had prior systemic chemotherapy alone and those who did not (p>0.05). No significant difference in pre treatment size of CLM was found between patients who eventually underwent surgical resection and those who remained unresectable (p>0.05).

**CONCLUSION**

Increased HU attenuation of colorectal liver metastases on pre-treatment contrast enhanced CT correlates with volumetric response and eventual surgical resectability following treatment with combination HAI plus systemic chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Pretreatment prediction of response to combination HAI and systemic chemotherapy by CT imaging may be helpful in directing targeted care of CLM.

**LL-GIS-MO7A** • Prospectively Acquired Low Doses in Abdominal CT and Role of Sinogram Affirmed Iterative REconstruction (Safire)

Sarabjeet Singh MD (Presenter); Sarvenaz Pourjabbar MD; Ranish D Khawaja MBBs, MD; Atul Padole MD; Garry Choy MD, MS; Mannudeep K Kalra MD *; Mischa Woisetschläger MD, PhD; Nils Dahlstrom MD, PhD; Anders Persson MD, PhD

**PURPOSE**

Assessment of the effect of Sinogram Affirmed iterative reconstruction (Safire) and Filtered Back Projection (FBP) technique on abdominal CT examination acquired at 200 mAs, 100 mAs, and 50 mAs.

**METHOD AND MATERIALS**

24 patients (mean age 64 ± 14 years, M:F 10:14) gave informed consent for an IRB approved prospective study for additional research images through the abdomen on 128 slice MDCT (Siemens Flash) at 100 mAs and 50 mAs over a scan length of 10 cm using combined modality technique. Images through entire abdomen were acquired at 200 mAs. The 50 and 100 mAs datasets were each reconstructed with FBP and four settings of Safire (S1, S2, S3, S4). The FBP 200 mAs images were compared side-by-side with FBP and Safire images from 50 and 100 mAs. The number and location of lesions, lesion size, lesion conspicuity, visibility of small structures were assessed by two experienced abdominal radiologists. The diagnostic acceptability was recorded on a four point scale (1= fully acceptable, 4= unacceptable). Objective noise and HU values were measured in liver and the descending aorta. The noise power spectrum was analyzed for FBP and different Safire settings.

**RESULTS**

A total of 43 lesions were detected on both FBP and Safire images. Minor blocky or pixilated appearance of 50 and 100 mAs images was noted at S3 and S4 Safire settings. No significant artifacts were noted on S1 and S2 Safire images. Objective noise was suboptimal in FBP and 50 mAs images, whereas noise was acceptable with S1, S2 and S3 and better than average on S4 setting. Safire could render 100 mAs images as fully acceptable for diagnostic confidence but 50 mAs Safire images were deemed to have lower diagnostic confidence compared to 200 mAs. As compared to 50 mAs FBP, objective noise was lower by 22.8% (22.9/29.7) on S1, 35% (19.3/29.7) on S2, 44.3% on S3 (16.7/29.3) and 54.8% (13.4/29.7) on S4 (p)<0.05. No significant difference in noise was noted at S3 and S4 Safire settings. No significant artifacts were noted on S1 and S2 Safire images. Image noise was suboptimal in FBPs.

**CONCLUSION**

Safire enabled reconstruction provides diagnostically acceptable abdominal CT images acquired at 100 mAs (50% reduced dose) but 50 mAs Safire images are not completely diagnostically acceptable despite reduced image noise.

CLINICAL RELEVANCE/APPLICATION

Radiation dose reduction down to 100 mAs is achievable with Safire enabled abdominal CT examinations.

**LL-GIS-MO8A** • Performance of LI-RADS Criteria for Diagnosis of Pathologically Proven Hepatocellular Carcinoma (HCC) Using Gd-EOB-DTPA: Can We Use Hepatobiliary Agents and Eliminate Tissue Diagnosis?

Stephanie Channual MD (Presenter); Anokh Pahwa MD; James Sayre PhD; Katrina R Beckett MD; David S Lu MD *; Steven S Raman MD

**PURPOSE**

To determine the performance of LI-RADS for the non-invasive diagnosis of HCC using Gd-EOB-DTPA MRI.

**METHOD AND MATERIALS**

This was an IRB approved, HIPAA compliant study with 84 consecutive suspected HCC nodules in 78 patients confirmed by percutaneous biopsy, resection, or explant within 90 days of Gd-EOB-DTPA MRI (EOB). Nodule size, presence of a capsule, signal intensity on T1-weighted imaging, and enhancement patterns were recorded. The nodules were then categorized as LI-RADS 3, 4, or 5 based on the LI-RADS v2013.1 ACR major criteria.

**RESULTS**

Of the 84 nodules, 76 were confirmed HCC (90.5%). A total of 15/84 nodules were categorized as LI-RADS 3, 27/84 as LI-RADS 4, and 42/84 as LI-RADS 5. Of these, 11, 25, and 40 nodules were pathologically proven as HCC, respectively (sensitivities 14%, 33%, and 53%, respectively; specificities 50%, 75%, and 75%, respectively). The PPV of LI-RADS 3, 4, and 5 were 73%, 93%, and 93%, respectively. The NPV of LI-RADS 3, 4, and 5 were 5.8%, 10.5%, and 14.3%, respectively. The accuracy of LI-RADS 4 and LI-RADS 5 was 44.3% on S3 (16.7/29.3) and 54.8% (13.4/29.7) on S4 (p)<0.05. No significant difference in noise was noted at S3 and S4 Safire settings. No significant artifacts were noted on S1 and S2 Safire images. Image noise was suboptimal in FBPs.
CONCLUSION
Although use of LI-RADS v2013.1 ACR criteria with EOB yields a high PPV and accuracy for diagnosing HCC, moderate sensitivity and specificity suggest that further refinement of the criteria may be necessary and tissue biopsy may be complementary for diagnosis.

CLINICAL RELEVANCE/APPLICATION
LI-RADS standardizes the diagnosis of nodules in cirrhotic livers using MRI with extracellular contrast agents, while its performance using Gd-EOB-DTPA, a hepatocyte-specific contrast, is unknown.

**LL-GIE-M09A • Structured Reports for Rectal Cancer MR Staging: A Bottom Up Approach**

**Bandar O Safar** MD (Presenter) ; **Myra K Feldman** MD ; **Joseph C Veniero** MD, PhD

**PURPOSE/AIM**
By viewing this exhibit, the participant will:

- Understand the MR diagnostic criteria used to stage rectal cancer using the TNM classification system.
- Recognize tumor features that impact surgical planning.
- Develop an organized, thorough approach to interpreting rectal cancer MR staging studies.
- Employ structured reporting when interpreting rectal cancer MR studies to clearly communicate findings essential for staging and surgical planning.

**CONTENT ORGANIZATION**
Our institution's structured report for rectal cancer staging will be provided. Each entry of the structured report will be discussed separately with emphasis on its importance for staging and surgical planning. Examples will be used to illustrate the spectrum of findings for each section of the structured report. Rectal anatomy and our rectal cancer MR protocol will also be reviewed.

**SUMMARY**
Rectal cancer can be accurately staged using preoperative magnetic resonance imaging. When interpreting these studies, the radiologist must clearly communicate findings essential for accurate staging and surgical planning. Structured reports (table 1) provide a clear format to communicate information needed by surgeons and oncologists to determine treatment options.

**Gastrointestinal - Monday Posters and Exhibits (12:45pm - 1:15pm)**

**Monday, 12:45 PM - 01:15 PM • Lakeside Learning Center**

**LL-GIS-MOB • AMA PRA Category 1 Credit ™:0.5**

**LL-GIE-M08B • Putting the Polyps Together: Imaging of the Hereditary Colorectal Cancer Syndromes**

**Betty Tuong** MD (Presenter) ; **Silvia D Chang** MD ; **Alison C Harris** MBChB

**PURPOSE/AIM**
1. Enhance the participant's knowledge of the hereditary colorectal cancer syndromes (HCRCS) and their manifestations.
2. Discuss imaging findings of the HCRCS with case examples from various fluoroscopic, ultrasound, CT and MR examinations, including CT enterography.
3. Highlight the important role of radiologists in recognizing these syndromes for diagnosis and screening.

**CONTENT ORGANIZATION**
1. The Genetics of Colorectal Cancer
2. Classification of the Hereditary Colorectal Cancer syndromes
   a. Non-polyposis syndromes
      - Lynch syndrome
   b. Polyposis syndromes
      - Adenomatous
      - Familial adenomatous polyposis coli and variants including Gardner syndrome
      - Hamartomatous
      - Peutz-Jeghers syndrome, juvenile polyposis, and PTEN hamartoma syndromes
3. Take-Home Points and Conclusion

**SUMMARY**
1. Our understanding of the hereditary colorectal cancer syndromes (HCRCS) continues to evolve, each with characteristic manifestations.
2. Radiologists should be familiar with the various HCRCS and their common imaging findings because early detection of these neoplasms may help decrease patient morbidity and mortality.

**LL-GIE-M09B • Pathways of the Subperitoneum: The Key to Challenging Diagnoses**

**Atalie C Thompson** BA,MPH (Presenter) ; **Lewis Shin** MD ; **Robert E Mindelzun** MD

**PURPOSE/AIM**
The purpose of this exhibit is to review the anatomic spaces of the pelvis and the three major pathways of the subperitoneum through which abnormal processes spread.

**CONTENT ORGANIZATION**
1. Review of Pelvic Anatomical Spaces - Illustrate the presvesical, perivesical, and external iliac spaces - Review helpful imaging signs to identify these spaces.
2. Identify the three major, predictable pathways of the subperitoneum, using case examples to demonstrate diagnostic significance:
   a. Lateral pathway: anterior and posterior pararenal, perirenal, infraracal and external iliac spaces
   b. Central pathway: inferior mesenteric artery to the aorta at L3
   c. Posterior pathway: primarily along the superior mesenteric vessels and its branches

**SUMMARY**
The major teaching points of this exhibit are: 1. Numerous radiological signs can aid in the characterization of pelvic extraperitoneal spaces, including the following: triangle, umbilical, molar tooth, and inferior epigastric vessel signs. 2. Knowledge of pelvic spaces and the ability to trace disease processes to their origin along these complex but predictable fascial pathways of the subperitoneum (i.e. lateral, central, and posterior) can enable the radiologist to make challenging and critically important diagnoses.

**LL-GIE1227-MOB • It's Not Always FNH: A Review of Entities That Can Appear Hyperintense on Hepatobiliary Phase Imaging**

**Manish Dhyani** MBBS (Presenter) ; **Sandeep S Hedgire** MD ; **Sheela Agarwal** MD, MS

**PURPOSE/AIM**
The use of hepatocyte specific contrast agents such as gadoxetic acid (Eovist) is becoming increasingly common for the characterization and detection of liver lesions. Early experience with gadoxetate was based on the straightforward principal that normal hepatocytes would appear hyperintense in hepatobiliary phase (HBP), and non-hepatocyte containing lesions would be dark. With experience, we now know...
that a number of various factors contribute to the appearance of a lesion on HBP and many entities previously not considered can appear hyperintense. Currently, numerous case reports/publications describe unusual appearances of various liver lesions particularly on the HBP of imaging, but there is no comprehensive repository for the range of appearances of these lesions.

CONTENT ORGANIZATION
1. Typical appearance of benign and malignant lesions of the liver on HBP - gadoxetate imaging.
2. All lesions that may appear as hyperintense on HBP, and the pathophysiology for the hyperintensity.
3. Role of T2-weighted and nonfat saturated HBP imaging in differentiating lesions.
4. Pitfalls: Experience within our institution.

SUMMARY
There is variable experience of a radiologist's familiarity with gadoxetate. The objective of this educational exhibit is to aid the radiologist in understanding the range of appearances of various liver lesions on MRI with gadoxetate.

LL-GIE-MO11B • Conventional Defecography and MR Defecography in Patients with Obstructive Defecation Syndrome: Pre and Post-operative Findings

Werner Kenn MD, PhD (Presenter) ; Birgit Hartung ; Henning Neubauer MD, MBA ; Thorsten A Bley MD ; Herbert Koestler PhD * ; Christoph Isbert

PURPOSE/AIM
To demonstrate the whole procedure of normal and pathologic defecography in conventional (CD) and MR defecography (MRD) as well as imaging findings after surgical treatment (e.g. STARR/POP STARR).

CONTENT ORGANIZATION
1. To review the indications 2. To show the techniques including dynamic 3D MR defecography 3. To demonstrate important measures as anorectal angle (ARA) and perineal descent (PD); to get familiar with pathologic findings such as intussusception, enterocoele, rectocoele, sigmoidocoele, cystocele, Retzius and Douglas hernia; to discriminate functional disorders (e.g. spastic pelvis floor syndrome) 4. To learn about surgical treatment options like i.e. stapled transanal resection (STARR) for intussusception and POP STARR for pelvic organ prolapses and their appearance in CD and MRD 5. Limitations of both modalities.

SUMMARY
The radiologist - especially when working in the colorectal surgical field - should be familiar with the techniques, indications and limitations of CD and MRD. As there are successful surgical procedures in patients with obstructive defecation syndrome he should have experience in interpreting post-operative defecography.

LL-GIE-MO12B • Body MR Imaging: Artifacts, K-space and Solutions

Pritesh Patel MD ; Ravi Seethmaraju PhD * ; John Kirsch PhD * ; Peter F Hahn MD, PhD * ; Alexander R Guimaraes MD, PhD (Presenter) *

PURPOSE/AIM
Body MR imaging is challenging secondary to the complex interrelationship of motion, secondary to respiration and peristalsis, and susceptibility secondary to gas from the bowel. Some of these issues are exacerbated at higher field strengths (e.g. 3T). The purpose of this exhibit is to familiarize the reader with the range of artifacts seen in body imaging at 1.5T and 3T, and to explain the etiology of these artifacts from the standpoint of basic MR physics in order to find solutions and improve image quality.

CONTENT ORGANIZATION
We will discuss in depth with case examples artifacts associated with body imaging at both 1.5T and 3T. We will categorize artifacts based on motion, spatial encoding, field strength, pulse sequence, coil type, location, B0 and B1 sensitivity profiles, chemical shift and parallel imaging. We will explain the etiology of these artifacts from basic MR physics using K-space encoding, and signal processing, proposing solutions, when possible.

SUMMARY
A better understanding of the cause of artifacts within the complex environment of body MRI is integral to improving the practice and meeting the challenges of novel pulse sequence design, parallel transmission, and increasing field strength.

LL-GIE-MO10B • Mesenteric Neoplasms: MRI Characteristics, Histopathological Correlation and Differential Diagnosis

Pardeep K Mittal MD (Presenter) ; Juan C Camacho ; Sajeev R Ezhapilli MBBS ; William C Small MD, PhD ; Krisztina Hanley MD ; Courtney A Coursey MD *

PURPOSE/AIM
1 This educational exhibit will highlight specific MR imaging features of mesenteric masses , associated clinicopathological findings and provide guide lines to reach specific diagnosis 2.To demonstrate MRI characteristics frequently encountered in both neoplastic and non- neoplastic mesenteric conditions and diagnostic clues

CONTENT ORGANIZATION
After a brief review of the anatomical extent and function of the mesentery, participants will be
a) Presented with differential diagnosis of mesenteric pathology, highlighting those frequently encountered. for example, mesenteric fibromatosis, desmoid tumors, inflammatory pseudotumor, sclerosing mesenteritis, carcinoïd, schwannoma, paraganglioma, and lymphoma, etc.
b) Participants will appreciate the benefit of MRI over CT due to its superior soft tissue characterization and multi-planar capabilities as an excellent diagnostic tool in allowing precise and detailed tumor characterization. c) Optimal MR imaging of the mesentery comprising fat suppression and dynamic contrast enhanced imaging including delayed imaging will be shown to be instrumental in successful characterization of mesenteric masses

SUMMARY
This exhibit will present the characterization of mesenteric masses at MRI and will offer a rational approach to the differential diagnosis of mesenteric masses depicted at MRI.

LL-GIS-MO1B • Non-contrast MR Hepatic Arteriography Using T-SLIP at 3T

Keitaro Soffue (Presenter) ; Takeshi Yoshikawa MD * ; Nobukazu Aoyama RT ; Katsusuke Kyotani RT ; Yoshiharu Ohno MD, PhD * ; Yoshimori Kassai MS * ; Saori Satou RT * ; Naoki Kanata MD ; Tomonori Kanda ; Hisanobu Koyama MD ; Mizuho Nishio MD * ; Kazuo Sugimura MD, PhD *

PURPOSE
To evaluate non-contrast MR hepatic arteriography using time-spatial labeling inversion pulse (T-SLIP) at 3T

METHOD AND MATERIALS
101 patients (m:59, f:42, mean: 65.0 yrs) who were suspected to have malignant tumor in the liver, bile duct (BD), or pancreas, underwent MRI at a 3T scanner. Non-contrast hepatic MR arteriography were obtained with T-SLIP (3D-true SSFP, selective IR, black blood inversion time: 1500, resp. trigger, scan time: 5-7min). Visualization of overall, right, left, and segment 4 (A4) hepatic arteries (HA) were scored by two radiologists on a 4-point scale. Scores of 3 or 4 for overall HA were assessed to be clinically acceptable. Anatomic classification was used for determining mesenteric potentials. Backgrounds, irregular respiration, HA narrowing, aortic arteriosclerosis,
cardiac enlargement, and visualization of BD, fluid, portal vein, and IJV, and artifacts, were recorded on a 4-point scale and their effects on HA visualization were assessed. In 41 patients, HA visualization was compared with CE-CTA. Presence of arterial encasement indicating vascular invasion was recorded.

RESULTS

CONCLUSION
Hepatic artery can be assessed and classified by non-contrast MRA using T-SLIP at 3T with exception of small proportion of patients.

CLINICAL RELEVANCE/APPLICATION
Hepatic artery can be assessed and classified by non-contrast MRA using T-SLIP at 3T with exception of small proportion of patients.

LL-GIS-MO2B • Diagnostic Value of Diffusion-weighted Magnetic Resonance Imaging of Infected Pancreatic Fluid Collections

Bruno Borens MD (Presenter) ; Marianna Arvanitakis ; Julie Absil PhD, MS ; Said El Bouchaibi MD ; Celso Matos MD ; Thierry Metens MD, PhD ; Maria-Antonetta Bali

PURPOSE
The aim of this study was to assess the diagnostic accuracy of diffusion-weighted resonance imaging (DW-MRI) in characterizing pancreatic fluid collections (PFC) and determining the presence of infection.

METHOD AND MATERIALS
26 consecutive patients with post-pancreatitis PFCs requiring transmural endoscopic ultrasound-guided (EUS) drainage were prospectively included. Exclusion criteria were previous drainage or surgery. Before the endoscopic procedure, DW-MRI was performed in all patients with high b-value (b=1000 s/mm2) and ADC measurements in the collections were calculated. An infected collection was suspected when high signal on DW-MRI of PFC and low ADC values were observed. After EUS drainage, bacteriological cultures of the intra-cystic fluid was performed and considered infected if these were positive (gold standard). Continuous values were reported as median and the 25th and 75th percentile points. Comparisons were performed using non-parametric tests. The diagnostic performance of DW-MRI was assessed by receiver operating characteristic analysis (ROC curve).

RESULTS
The underlying disease was acute (n=15, 58%) and chronic pancreatitis (n=11, 42%). Median ADC was statistically significantly lower in infected vs non infected PFCs: 0.66 (0.42 and 0.82) vs 2.3 (2.0 and 2.5) x10-3mm2/sec; p=0.01. Sensitivity, specificity, accuracy, negative predictive value (NPV) and positive predictive value (PPV) of DW-MRI for predicting PFC infection were, respectively, 55% (5/9), 94% (16/17), 80% (21/26), 80% (16/20) and 83% (5/6). When patients previously treated with antibiotics were excluded (n=9) from the statistical analysis, sensitivity, specificity, accuracy, NPV and PPV were respectively 75%, 92%, 88%, 92% and 75%. ROC curve calculated a cut-off of 0.9 x 10-3mm2/sec with a sensitivity of 100% and a specificity of 95%.

CONCLUSION
DW-MRI may provide additional information concerning PFC assessment before drainage. Results show high diagnostic accuracy and negative predictive values, which can help in excluding PFC infection and determining time of drainage.

CLINICAL RELEVANCE/APPLICATION
Diffusion-weighted magnetic resonance imaging is a non invasive diagnostic tool showing high diagnostic accuracy that may provide useful information for therapeutic management of pancreatic fluid collection.

LL-GIS-MO3B • Reproducibility and Comparison Study for Acoustic Radiation Force Impulse Imaging and Supersonic Shear Imaging

Hyunsik Woo MD (Presenter) ; Jae Young Lee MD ; Jeong Hee Yoon MD ; Won Kim MD, PhD ; Belong Cho

PURPOSE
The purpose of this study was to evaluate and compare intra-observer and inter-observer agreement of acoustic radiation force impulse imaging (ARFI) and supersonic shear imaging (SSI).

METHOD AND MATERIALS
This study was prospectively designed and performed with our Institutional Review Board approval. From April 2012 to April 2013, 79 patients (49 men, 30 women, mean age 56.7 years) were enrolled, which included 29 healthy patients, 25 patients with chronic hepatitis with Child class A, and 25 patients with chronic hepatitis Child class B or C. Three experienced abdominal radiologists performed ARFI and SSI at the same time in each patient with 9 measurements per each imaging. Four weeks later, second session was performed with the same protocol for the same patients by the same radiologists. Inter-observer and intra-observer agreement measured by intraclass correlation coefficient, technical success rate, and time taken for measurement of ARFI and SSI were calculated and statistically analyzed.

RESULTS
Inter-observer agreements of ARFI and SSI were 0.932 and 0.805, respectively. Intra-observer agreement of ARFI and SSI between first and second session were 0.935 and 0.825, respectively. Pearson correlation coefficient between ARFI and SSI was 0.790. The conversion equation derived from linear regression was $\text{SSI (m/s)} = 0.9867 \times \text{ARFI (m/s)} + 0.3274$. Technical success rates were 99.8% and 98.5% (p=0.07), and the average study time was 83.6 seconds and 302.0 seconds for ARFI and SSI, respectively (p < 0.0001).

CONCLUSION
ARFI showed slightly better reproducibility and technical success rate and significantly shorter study time than SSI. They also showed the potential to be used interchangeably.

CLINICAL RELEVANCE/APPLICATION
As both ARFI and SSI show good inter-observer and intra-observer agreements and good correlation, they might be used interchangeably in the evaluation of liver fibrosis.

LL-GIS-MO4B • A Retrospective MRI Evaluation of Diffuse Peritoneal Metastatic Disease: Value in Pre-operative Assessment of the Peritoneal Carcinomatosis Index (PCI)

Neelima Gorantla MD (Presenter) ; Drew F Pierce MD ; Arpit M Nagar MBBS ; Sherif Abdel-Misih MD ; Zarine K Shah MD

PURPOSE
Imaging has been an integral part in the management for patients with peritoneal metastases. MRI is emerging as a powerful tool with a high degree of inherent contrast and improving spatial resolution with newer scanners and advanced MRI techniques. We sought to determine how well MRI imaging findings correlates with surgical Peritoneal Carcinomatosis Index (PCI).

METHOD AND MATERIALS
This is a retrospective review of radiologic and clinical records of 13 patients with a history of peritoneal malignancy that underwent MRI of the abdomen and pelvis. All patients underwent cytoreduction at a single institution between 1/1/2011 and 4/1/2012. Preoperative abdominal and pelvic MRI of these patients with breath-hold Diffusion weighted imaging (DWI), T1-weighted spoiled gradient-echo, T2-weighted fast spin-echo, pre-contrast and 5-minute delayed gadolinium-enhanced imaging was reviewed retrospectively by a radiologist who was blinded to imaging and surgical impressions. Details of surgical findings and surgical PCI were compared with MRI findings and imaging based scoring by an independent radiologist. For the purpose of this study, a difference between Surgical PCI and imaging scoring greater than 5 was considered significant. Also, surgical findings and impressions were taken into consideration for analysis.

CLINICAL RELEVANCE/APPLICATION
As both ARFI and SSI show good inter-observer and intra-observer agreements and good correlation, they might be used interchangeably in the evaluation of liver fibrosis.
RESULTS
5/13 studies showed discrepancy between surgical PCI and imaging score and in 2 out of these 5 patients would have impacted surgical decision making. In 8/13 patients, despite total surgical and imaging scores being relatively similar, there were discrepancies when individual regions comprising the PCI score were compared.

CONCLUSION
MRI using DWI is a valuable tool for assessment of disease burden and location in patients with peritoneal surface malignancies, but there is difficulty in correlation with the surgical PCI. In our study group, MRI has a higher sensitivity to detect metastatic lymph nodes, whereas some small lesions were better seen at surgery. This is a small group of patients and we propose that a larger study group and a more robust image based scoring system will likely result in more close correlation with surgical findings.

CLINICAL RELEVANCE/APPLICATION
MRI with DWI can demonstrate peritoneal metastasis and has the potential to be incorporated as part of a MR imaging prior to surgical exploration.

LL-GIS-MOSB • Low Radiation Dose Abdominal CT with Iterative Model Reconstruction (IMR): Clinical Impact on Thin Slice Images

Takeshi Nakaura MD (Presenter) ; Shinichi Tokuyasu RT * ; Masafumi Kido ; Ryo Ittani ; Kazunori Harada ; Yasuyuki Yamashita MD *

PURPOSE
Recently, low radiation dose abdominal CT has become clinically available through techniques such as iterative reconstruction techniques and low kVp imaging. However, increased image noise is a serious problem in the thin slice images. The purpose of this study was to evaluate the usefulness of the recent introduced iterative model reconstruction (IMR, Philips Healthcare) in low dose abdominal CT with the thin slice images.

METHOD AND MATERIALS
This prospective study received institutional review board approval; prior informed consent to participate was obtained from all patients. This study enrolled 36 patients who were imaged with low radiation dose abdominal and pelvis CT at the 100 kVp setting. We reconstructed clinical studies with filtered back projection (FBP), hybrid-iterative reconstruction (iDose4, Philips Healthcare) and IMR with 1, 3 and 5 mm slice thickness. We compared the image noise and the rate of increase of image noise in 1 and 3 mm thickness images with 5 mm thickness images between the reconstruction methods using the Scheftee test. Two independent readers assessed image contrast, image noise, image sharpness and overall image quality on a 4-point scale about 1mm thickness images with each reconstruction technique.

RESULTS
The mean radiation dose of patients was 4.6 mSv ±1.5. The rate of increase in noise in 1mm thickness images (FBP: 2.21±0.23 and iDose4: 2.16±0.30) and 3mm thickness images (FBP: 1.30±0.13 and iDose4: 1.29±0.21) were almost inversely proportional to the square-root of the rate of decrease in slice thickness in FBP and iDose4 reconstruction and the differences were not significant (p>0.05). However, the rate of increase in image noise in thin slice images with IMR reconstruction (1mm: 1.47±0.17 and 3mm: 1.18±0.13) were significantly lower than other reconstruction techniques (p<0.001). The correlation between SE ratio and grade of varices was analyzed with the Pearson product-moment correlation. Receiver operating characteristic (ROC) curves were constructed, and the area under the ROC curve (AUC) was calculated. Optimal cutoff values for SE ratio were selected to maximize sensitivity, specificity, and diagnostic accuracy. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated by using cutoffs obtained from the ROC curves. Inter and intraobserver variability in RTE and EGD was calculated

CONCLUSION
IMR reconstruction offers dramatic noise reduction in low dose abdominal CT especially at thin slice images as compared with FBP and iDose4.

CLINICAL RELEVANCE/APPLICATION
We did not need to increase the radiation dose for thin slice images with IMR technique.

LL-GIS-MOB • Real-time Splenic Elastography as a Tool for Detection and Grading of Oesophagogastric Varices: Has Its Time Really Come?-An Analytic Study of Correlation between Splenic Elasticity Score and Endoscopic Grade of Varices

Vasanthakumar Venugopal MD (Presenter) ; Sunil Kumar Puri MD ; Nishith Kumar MD ; Ishrat Afshan MBBS ; Santosh K Arjun MBBS

PURPOSE
To evaluate the role of Splenic elasticity ratio measured by Real-time elastography(RTE) in predicting the presence of esophageal varices in patients with portal hypertension
To analyse the correlation between the Splenic elasticity score and endoscopic grade of esophago-gastric varices

METHOD AND MATERIALS
This prospective study included 34 patients with chronic liver disease being evaluated for portal hypertension and planned for esophagogastroduodenoscopy (EGD). Initial B-mode and duplex sonographic evaluation was followed by examination of spleen by RTE. The correlation of SE ratio and grade of varices was analyzed with the Pearson product-moment correlation coefficient. Receiver operating characteristic (ROC) curves were constructed, and the area under the ROC curve (AUC) was calculated. Optimal cutoff values for SE ratio were selected to maximize sensitivity, specificity, and diagnostic accuracy. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated by using cutoffs obtained from the ROC curves. Inter and intraobserver variability in RTE and EGD was calculated

RESULTS
Splenic elasticity and variceal grade show significant linear correlation (R = 0.78, P<0.05). Splenic elasticity ratio can be used as a safe and cost effective screening modality to predict the presence and grading of esophageal varices and hence the probability of severe bleeding episodes.

CONCLUSION
There is a significant correlation between splenic elasticity and presence, severity of grade and propensity for bleeding of esophageal varices. The higher the elasticity score higher is the chance for severe life threatening bleeding.

CLINICAL RELEVANCE/APPLICATION
Splenic elasticity ratio can be used as a safe and cost effective screening modality to predict the presence and grading of esophageal varices and hence the probability of severe bleeding episodes.

LL-GIS-MOB • Correlation of Perfusion Parameters on Dynamic Contrast-enhanced MRI with Prognostic Factors of Rectal Cancer

Dong Myung Yeo ; Soon Nam Oh MD ; Joon Sung Choi (Presenter) ; Sung Eun Rha MD ; Seung Eun Jung MD ; Jae Young Byun MD ; Michael Y Park MD

PURPOSE
To investigate whether quantitative parameters derived from dynamic contrast-enhanced (DCE) MRI correlate with prognostic pathologic markers of rectal cancers.

METHOD AND MATERIALS
A total of 46 patients with rectal cancer underwent preoperative DCE MRI. Using a two-compartmental model, the quantitative parameters (Ktrans, kep, Ve and IAUC) from the whole transverse ROI of the entire tumor were calculated. Histological specimens were analyzed for tumor size, T stage, N stage, histologic grade, lymphatic, vascular or perineural invasion, expression of epidermal growth factor receptor (EGFR), and KRAS gene mutation. Correlations of the perfusion parameters with histologic markers were determined using
RESULTS
Mean Kep showed a significant correlation with T stage (P = 0.021). EGFR positive cancers displayed a higher mean Ktrans (p = 0.045) and Kep (p = 0.038) than EGFR negative cancers. No significant correlations were found between DCE MRI parameters and N stage, histologic grade, or KRAS gene mutation.

CONCLUSION
Rectal cancers with higher Kep might have poor prognosis including higher T stage and expression of EGFR.

CLINICAL RELEVANCE/APPLICATION
The pharmacokinetic parameters of DCE MRI might have the potential to predict prognosis in patients with rectal cancer.
Panel Discussion: HCC in the World: How Do We Put All this Information Together? New International Staging System? Are Guidelines Really Useful?

VSIO21-04 • HCC Management in Korea

Jin Wook Chung MD (Presenter) *

LEARNING OBJECTIVES
View learning objectives under main course title.

VSIO21-05 • HCC Management in Hong Kong, China

Ronnie T Poon (Presenter)

LEARNING OBJECTIVES
View learning objectives under main course title.

VSIO21-06 • Radiofrequency Ablation of 318 Cases of Hepatocellular Carcinoma as First Line Treatment: 10 Years Survival Result and Prognostic Factors

Wei Yang (Presenter) ; Wei Wu PhD ; Jung Chieh Lee ; Zhong-Yi Zhang PhD ; Min Hua Chen MD ; Kun Yan MA

PURPOSE
To our knowledge, the long-term (>5 years) survival results for radiofrequency ablation (RFA) in HCC is few. Our study aimed to investigate the efficacy of RFA for 318 patients with hepatocellular carcinoma (HCC) as first line treatment, and the prognostic factors for post-RFA survival rate.

METHOD AND MATERIALS
From 2000 to 2012, 730 patients with HCCs underwent ultrasound guided percutaneous RFA treatment in our department. Among them, 318 consecutive patients received RFA as first treatment and enrolled in this study. They were 251 males and 67 females, average age 60.3±11.3 years (24-87 years). The HCC were 1.0-6.7 cm in diameters (average 3.3±1.2 cm). Univariate and multivariate analysis with 15 potential variables were examined to identify prognostic factors for post-RFA survival rate.

RESULTS
The overall post-RFA survival rates at 1, 3, 5, 7, 10 year were 90.2%, 67.3%, 53.6%, 41.2% and 29.1%, respectively. In the 209 patients with stage I of HCC (AJCC staging), the 1, 3, 5, 7, 10 year survival rates were 94.2%, 72.9%, 63.6%, 57.6%, 41.5% respectively. In the 239 patients with liver function class A (Child-Pugh classification), the 1, 3, 5, 7, 10 year survival rates were 94.4%, 75.8%, 64.3%, 52.3%, 32.4%, respectively. Ten potential factors were found with significant effects on survival rate, and they were AJCC staging, tumor pathological grading, number of tumors, pre-RFA liver function enzymes, pre-RFA AFP level, Child-Pugh classification, portal vein hypertension, using contrast ultrasound in RFA procedure, RFA electrode type and tumor necrosis one month after RFA. After multivariate analysis, 4 factors were identified as independent prognostic factors for survival rate, and they were Child-Pugh classification, number of tumors, pre-RFA AFP level, and portal vein hypertension. Totally, 548 RFA sessions were performed and major complications occurred in 12 sessions (2.1%).

CONCLUSION
This long-term follow-up study on a large group of HCC patients confirmed that RFA could achieve favorable outcome on HCC patients as first line treatment, especially for patients with child-Pugh class A, single tumor, low AFP level pre-RFA and without portal vein hypertension.

CLINICAL RELEVANCE/APPLICATION
This study provided evidence that RFA for early HCC was effective and safe as a first-line treatment even for patients usually considered good candidates for surgery.

VSIO21-07 • HCC Management in Japan

Yasuaki Arai MD (Presenter) *

LEARNING OBJECTIVES
View learning objectives under main course title.

VSIO21-08 • A Minimal Ablative Margin Is Acceptable for Radiofrequency Ablation of Small Hepatocellular Carcinoma: A Long-term, Follow-up Study Using Magnetic Resonance Imaging with Impaired Ferucarbotran Clearance

Kensaku Mori MD (Presenter) ; Kuniaki Fukuda MD ; Katsushiro Nasu MD, PhD ; Michiko Nagai MD ; Tsukasa Saida MD ; Manabu Minami MD, PhD

PURPOSE
We aimed to prospectively compare the local recurrence rates after radiofrequency ablation (RFA) for small (=3 cm) hepatocellular carcinomas (HCCs) among different ablative margin (AM) statuses on magnetic resonance imaging (MRI) with impaired ferucarbotran clearance.

METHOD AND MATERIALS
Fifty-five patients with 57 HCCs (diameter: 0.8-2.7 cm; mean ± SD, 1.6 ± 0.5 cm) underwent RFA 2-7 h after ferucarbotran-enhanced MRI. On unenhanced T2*-weighted images acquired after 3-5 days, AMs appeared as hypointense rims owing to impaired ferucarbotran clearance. AM status was classified as AM-plus, AM completely surrounding the tumor; AM-zero, partly discontinuous AM without tumor protrusion; or AM-minus, discontinuous AM with tumor protrusion. The minimal AM thicknesses were measured in the AM-plus group. The range of follow-up periods in the patients with and without local recurrence was 0-45 months (10 ± 15 months) and 7-58 months (28 ± 14 months), respectively. Local recurrence rates of different AM statuses were compared using the Kaplan-Meier method and log rank test.

RESULTS
Of the 57 HCCs, 34 (60%), 16 (28%), and 7 (12%) were classified as AM-plus, AM-zero, and AM-minus groups, respectively. The respective 1-, 2-, 3-, and 4-year local recurrence rates were 3%, 8%, 8%, and 31% for the AM-plus group; 12%, 12%, 20%, and 20% for the AM-zero group; and 71%, 71%, not applicable (NA), and NA for AM-minus group. The local recurrence rates were significantly lower for the AM-plus and AM-zero groups than for the AM-minus group (P < 0.001 and P = 0.003, respectively). However, the difference of local recurrence rates between AM-plus and AM-zero groups was not significant (P = 0.454). In the AM-plus, the local recurrence rates were 22% (2/9), 10% (1/10), 0% (0/4), and 0% (0/6) for AMs of 1 mm, 2 mm, 3 mm, 4 mm, and =5 mm, respectively.

CONCLUSION
When AMs are assessed after RFA for small HCCs by using MRI with impaired ferucarbotran clearance, the minimal AMs are acceptable to avoid local recurrence in a long-term period, although AMs of =3 mm seems preferable.

CLINICAL RELEVANCE/APPLICATION
MRI with impaired ferucarbotran clearance enables precise assessment of AMs after RFA and will contribute to avoid not only insufficient but also overzealous treatment for small HCCs.
LEARNING OBJECTIVES
View learning objectives under main course title.

VSIO21-10 • Intraarterial Therapies in the US: Where Are We?
Jean-Francois H Geschwind MD (Presenter) *

LEARNING OBJECTIVES
1) Understand patient selection process. 2) Understand the patient indications and complications. 3) Understand the rationale for combining anti-angiogenic agent with loco-regional therapies. 4) Understand the results of various catheter based intra-arterial therapies for Liver Cancer.

VSIO21-11 • Final Analysis of GIDEON (Global Investigation of therapeutic DECisions in hepatocellular carcinoma and Of its treatment with sorafeNIB): Regional Trends, Safety, and Outcomes in Patients Receiving Concomitant Transsudal Chemoembolization
Jean-Francois H Geschwind MD (Presenter) *; Masatoshi Kudo; Jorge Marrero *; Alan P Venook MD *; Sheng-Long Ye; Jean-Pierre Bronowicki *; Xiao-Ping Chen; Lucy Dagher; Junji Furuse; Laura Ladron De Guevara *; Christos Papandreu *; Arun J Sanyal; Tadatoshi Takayama; Seung Kew Yoon MD, PhD; Keiko Nakajima *; Riccardo A Lencioni MD

PURPOSE
Transarterial chemoembolization (TACE) and sorafenib represent distinct treatment modalities for hepatocellular carcinoma (HCC), and there is a strong rationale and growing evidence supporting the use of TACE and sorafenib combined in unresectable HCC (uHCC) patients. GIDEON is a large, non-interventional study conducted in uHCC patients treated with sorafenib. The study allows for analysis of global treatment patterns in real-life practice, including concomitant TACE use.

METHOD AND MATERIALS
Data were collected from >3000 patients in whom the decision to treat with sorafenib had been made in clinical practice. Treatment history and disease characteristics were recorded at study entry; safety and outcomes data were collected during follow-up.

RESULTS
3202 patients comprised the final safety population. Of these, 47.2% received prior TACE, 10.1% received concomitant TACE, and 7.3% received TACE both prior to and concomitantly with sorafenib. Regionally, concomitant TACE use was highest in Latin America (14.4%), Asia-Pacific (13.5%), and the US (13.0%), with the lowest use in the EU (4.7%). Overall, of the patients who received concomitant TACE, the greatest number were from the US, China, and Japan (22.5%, 24.6%, and 19.1%, respectively). Patients who received concomitant TACE had a similar incidence of drug-related adverse events (88.6%) to those who did not (84.9%), as well as a similar incidence of serious drug-related adverse events (6.2% and 9.6%, respectively). In the intent-to-treat population (n=3213), median overall survival (months [95% CI]) was longer in patients who received concomitant TACE (21.6 [17.9-upper limit not estimable]) than in those who did not (9.7 [9.2-10.4]). Time to progression was also slightly higher in patients who received concomitant TACE (6.6 [5.8-7.6]) compared with those who did not (4.5 [4.1-4.8]).

CONCLUSION
The GIDEON study provides insight into treatment patterns in clinical practice. Data from the GIDEON study suggest that, globally, TACE is used concomitantly with sorafenib and appears to be a valid therapeutic option in patients with uHCC.

CLINICAL RELEVANCE/APPLICATION
The optimal role of TACE and sorafenib combined in the HCC treatment pathway is of increasing clinical interest. Data from GIDEON add to the evidence to further evaluate this approach.

VSIO21-12 • Assessment of Tumor Response
Riad Salem MD, MBA (Presenter) *

LEARNING OBJECTIVES
1) Review methods of response assessment. 2) Discuss limitations of current methods. 3) Describe future imaging concepts in development.

VSIO21-13 • Evaluation of Tumor Necrosis in Liver Explants after Chemoemobilization or Radiofrequency Ablation as Bridge Therapies for Hepatocellular Carcinoma
Carmen Garcia Alba MD (Presenter); Julien Cazejust MD; Fabiano Perdigao; Bertrand Besouard MD; Dominique Wendum MD, PhD; Yves M Menu MD; Olivier Soubrane; Olivier Rosmorduc

PURPOSE
To compare, in liver explants, the tumor necrosis rate of hepatocellular carcinoma (HCC) treated by chemoembolization (TACE) or radiofrequency ablation (RFA) as bridge therapies for patients on the waiting list for liver transplantation.

METHOD AND MATERIALS
This monocentric retrospective study included 38 liver transplanted patients between November 2009 and December 2012 with history of HCC treated with bridge therapies while on the waiting list for liver transplantation. All treatments were approved by the Multidisciplinary Tumor Board of our institution following BCLC and EASL guidelines. Treatments were performed by experienced interventional radiologists. Anatomopathologic study of the liver explants was performed by an experienced anatomopathologist. In patients with consecutive treatments, only the last one was taken into consideration in this study.

RESULTS
Twelve patients underwent RFA for 14 lesions (mean 1.17 lesions per patient). The mean tumor size was 24mm (SD 7), with a mean necrosis rate of 93% (SD 13). No lesion treated by RFA had a necrosis rate >90%. Twelve patients underwent TACE for 14 lesions (mean 1.17 lesions per patient). The mean tumor size was 24mm (SD 7), with a mean necrosis rate of 93% (SD 13). No lesion treated by TACE had a necrosis rate >90%.

CONCLUSION
Tumor necrosis rate for both treatments was >80% on liver explants. RFA showed a trend toward higher tumor necrosis rate than TACE. TACE allowed treating twice as many lesions per patient as RFA.

CLINICAL RELEVANCE/APPLICATION
The use of bridge therapies for HCC prevents from progression related dropout, with a high necrosis rate for both treatments studied (>80%) demonstrated on liver explants.

VSIO21-14 • Tumor Board

LEARNING OBJECTIVES
1) The algorithm by which patients with HCC are worked up and their appropriateness for transplant or resection will be discussed.

VSIO21-15 • Percutaneous Microwave Ablation of Hepatocellular Carcinoma: Early Clinical Results with 106 Tumors
Timothy J Ziemlewicz MD (Presenter); J. Louis Hinshaw MD *; Meghan G Lubner MD; Christopher L Brace PhD *; Marci
Iterative Model Reconstruction (IMR) for Low kVp Imaging

SSE07

Monday, 03:00 PM - 04:00 PM • E353A

Rizwan Aslam

Moderator

CT numbers with the half contrast dose 80 kVp protocol were significantly higher than with the 120 kVp protocol (abdominal aorta: 371.2 ± 22.4 vs 260.3 ± 17.2). The total effective radiation dose was 42% lower with 80-kVp scan than with 120-kVp scan (9.0 mSv ± 1.3 vs 15.6 mSv ± 2.6). CT reconstruction (iDose 4) and iterative model reconstruction (IMR) virtually noise free images. We evaluated the feasibility of a half contrast agent dose and low radiation dose protocol for abdominal dynamic CT using 80 kVp and the IMR technique.

METHOD AND MATERIALS

Between December 2010 and March 2013 we treated 106 hepatocellular carcinomas in 75 patients via a percutaneous approach utilizing US and/or CT guidance. There were 65 male and 10 female patients with mean age of 61 years (range 44-82). All procedures were performed with a high-powered, gas-cooled microwave system (Ceretis 140, Newave Medical, Madison, WI). Mean power was 77 Watts (range 30-140 Watts) and mean ablation time 5.3 minutes (range 1-11.5 minutes).

RESULTS

Tumors ranged in size from 0.5 to 7.0 cm (mean 2.5 cm) and median imaging follow-up was 7 months. All treatments were considered technically successful with no evidence of residual tumor at immediate post-procedure CECT. Primary treatment effectiveness by imaging was 88.7% (94/106), 92.5% (87/94) for tumors < 4 cm and 61.5% (8/13) for tumors > 4 cm. Of the tumor progression in lesions affecting the treatment site, patient positioning, off centering, and scanning with arms by side accounted for higher than acceptable radiation dose. A prospective study was to retrospectively review the results in the first 75 patients with hepatocellular carcinoma (HCC) treated with a high-power, gas-cooled MW device at a single center.

CONCLUSION

The results of this study suggest that IMR can be safely used with treatment effectiveness equivalent or improved from other percutaneous ablation modalities.

CLINICAL RELEVANCE/APPLICATION

Microwave tumor ablation can be safe and effective when compared with more established modalities such as radiofrequency ablation, however more research of effectiveness is needed.

Gastrointestinal (CT Dose Reduction II)

Monday, 03:00 PM - 04:00 PM • E353A

SSE07 • AMA PRA Category 1 Credit ™:1 • ARRT Category A+ Credit:1

Moderator Meghan G Lubner , MD

Moderator Rizwan Aslam , MBCh *

SSE07-01 • Factors Leading to High Dose CT Scans at a Tertiary Care Center: Can We Avoid Them?

Priyanka Prakash MD (Presenter) ; William W Boonn MD * ; Tessa S Cook MD, PhD

PURPOSE

To identify patients scanned with above acceptable radiation levels for CT abdomen and pelvis examinations (CTAP) and assess the reasons for high-dose scans.

METHOD AND MATERIALS

CTAP examinations between July 2012 and March 2013 on 64-slice (Sensation 64, Siemens) scanners were reviewed. All scans were acquired using automatic tube current modulation. Remaining scan parameters were held constant at pitch 1, slice thickness 5mm, collimation 10 and kVp 120 except for very large patients. The acquisition details (mean mAs, kVp, scan length, effective patient diameter) and dose details including CTDIvol, effective dose, size specific dose estimate (SSDE), dose length product (DLP), organ specific effective doses for these scans were extracted using a commercial software (eXposure, Version 1). The above acceptable radiation dose was defined as =2 standard deviations above the respective means. All patients who underwent the CT scan with = 2 standard deviations above the mean DLP, effective dose and SSDE were identified. These scans were reviewed on PACS to identify the reason for high doses.

RESULTS

1685 scans (995 females, 690 males) were included in the study. The mean DLP, effective dose and SSDE for these scans were 734.7±338.5mGy-cm, 13.2±6.4mGy-cm and 15.6±3.8mGy. The scans with doses greater than DLP of 1411.6 (35; 6M, 29F); effective dose of 25.9 (29; 12M, 17F) and SSDE of 23.1 (47; 7M, 40F) were identified. The reasons for high doses were patient size (19/29), 140 kVp (7/47), scanning with arms by side (24/47) and motion, off centering, abdominal wall excluded from FOV (11/35). Similarly, patient size (9/29), 140 kVp (3/29), scan length (3/29) and patient off centering (17/47) were the identifiable factors.

CONCLUSION

Patient size, 140 kVp, repeats, patient off centering and scanning with arms by side account for higher than acceptable radiation dose. Of these, patient off centering and repeats are avoidable factors. Scanning with arms by the side may be avoidable in certain circumstances.

CLINICAL RELEVANCE/APPLICATION

Technologists can be given feedback/ in-service training reiterating the role of proper patient positioning, avoiding repeats and scanning with arms above head to avoid unnecessary radiation exposure.

SSE07-02 • Half Contrast Agent Dose and Low Radiation Dose Protocol for Abdominal Dynamic CT: Clinical Impact of the Iterative Model Reconstruction (IMR) for Low kVp Imaging

Takeshi Nakaura MD (Presenter) ; Shinichi Tokuyasu RT * ; Masafumi Kidoh ; Ryo Itatani ; Kazunori Harada ; Yasuyuki Yamashita MD * ; Shinichi Nakamura MD

PURPOSE

Low kilo-voltage (kVp) CT is well suited for low contrast and low radiation dose abdominal CT; however, increased image noise is a problem. The recent introduced iterative model reconstruction (IMR, Philips Healthcare) dramatically reduces the image noise and offers virtually noise free images. We evaluated the feasibility of a half contrast agent dose and low radiation dose protocol for abdominal dynamic CT using 80 kVp and the IMR technique.

METHOD AND MATERIALS

This prospective study received institutional review board approval; prior informed consent was obtained from all patients. We enrolled 30 patients who underwent abdominal dynamic CT using 80-kVp setting with a half contrast dose (300 mgI/kg) during 30 sec. We also enrolled 30 patients who were scanned with a standard 120-kVp protocol with filtered back projection (FBP) technique using the standard contrast dose of 600 mgI/kg during 30 sec as a control group. The 80-kVp images were reconstructed with FBP, hybrid-iterative reconstruction (iDose4) and IMR. We compared the effective dose (ED) of each protocol and evaluated image noise, CT numbers and the contrast to noise ratio (CNR) of 120 kVp and FBP-, iDose4-, IMR-reconstructed 80 kVp images at the abdominal aorta in hepatic arterial phase (HAP) and hepatic parenchyma in portal venous phase (PVP).

RESULTS

The total effective radiation dose was 42% lower with 80-kVp scan than with 120-kVp scan (9.0 mSv ± 1.3 vs 15.6 mSv ± 2.6). CT numbers and CNR of 80-kVp images were significantly higher than with the 120-kVp protocol, and comparable to 120 kVp images with high dose images (120 kVp: 220.1 ± 18.7 vs 80 kVp: 226.1 ± 18.3) that the effective dose and SSDE were significantly lower with the half contrast agent dose protocol than with the standard 120-kVp dose protocol (80 kVp: 15.6 ± 3.8 mSv vs 120 kVp: 20.1 ± 4.2 mSv; 80 kVp: 23.1 ± 4.8 mSv vs 120 kVp: 29.0 ± 5.6 mSv).CT numbers and CNR were significantly higher at the abdominal aorta in HAP with 80-kVp images than with 120-kVp images and comparable with 120-kVp images with high dose images. CT numbers and CNR were significantly higher at the abdominal aorta in PVP with 80-kVp images than with 120-kVp images and comparable with 120-kVp images with high dose images.
numbers with the half contrast dose 80 kVp protocol were significantly higher than with the 120 kVp protocol (abdominal aorta: 371.2 ± 65.1 vs 333.3 ± 46.9, p = 0.04; hepatic parenchyma: 121.1 ± 12.6 vs 107.7 ± 9.3, p < 0.01). IMR and iDose technique decreased mean image noise by 72% and 45% as compared with FBP technique at 80 kVp scan (IMR: 4.5 ± 0.7; iDose4: 8.8 ± 1.1; FBP: 15.8 ± 2.0, 120 kVp: 8.3 ± 1.6, respectively). The CNR of 80-kVp with IMR were significantly higher than 120-kVp protocols (abdominal aorta: 87.9 ± 19.8 vs 42.5 ± 10.8, p < 0.01; hepatic parenchyma: 26.3 ± 4.5 vs 13.2 ± 3.2, p < 0.01).

CONCLUSION
IMR is a promising technique to improve the image quality of the half contrast agent dose and low radiation dose protocol for abdominal dynamic CT with low kVp setting.

CLINICAL RELEVANCE/APPLICATION
The contrast dose for abdominal dynamic CT can be reduced by 50% by using a 80 kVp setting with IMR with improved image quality and reduced radiation dose.

SSE07-03 • How to Choose Spectral CT Imaging Protocol Individually: A Dose Study in Abdomen
Tan Guo MD (Presenter); Cheng Zhou MD; Wen Chen; Juan Chen MD, PhD

PURPOSE
Spectral CT scan is thought of high dose level, but different protocol combinations can ensure a relative low dose. The aim of this study is to discuss choosing spectral CT protocol individually for each patient in abdominal examinations.

METHOD AND MATERIALS
This was a retrospective study using the imaging data of another abdomen research. 44 patients underwent two phase enhancement abdominal scan. GSI mode scan with fixed tube current were used in artery phase and conventional 120 kVp scan with auto tube current were used in portal venous phase (GE discovery CT 750 HD, GE Healthcare). There were two protocol settings of GSI mode scan (protocol A with pitch 1.375 and protocol B with pitch 0.984), and 31 patients underwent protocol A while others underwent protocol B. The CTDI was fixed in protocol A (15.64 mGy) and protocol B (21.84 mGy) for fixed tube current. The 44 patients were divided into 3 groups according to BMI (low BMI: 26). The noises and CTDI were compared in different groups and protocols between GSI mode scan and conventional 120 kVp scan.

RESULTS
The CTDI of GSI mode scan with both protocol A or B were significant higher than conventional 120 kVp scan (7.95 mGy ) in low BMI group, the noises of GSI mode scans (6.3±0.8) were significant lower than conventional scan (11.36±2.1). In the medium BMI group, the CTDI of protocol A didn't show significant difference in comparison with conventional scan (14.97 mGy), CTDI of protocol B was significant higher than conventional scan (16.88 mGy). The noises of protocol A (10.3±0.9) and B (8.9±0.8) didn't show significant difference compared with conventional scan (24.46 mGy), CTDI of protocol B didn't show significant difference compared with conventional scan (26.45 mGy). The noises of protocol A (8.6±1.3) were equal to the noises of conventional scan, and the noises of protocol B (7.7±1.0) were significant lower than conventional scan.

CONCLUSION
In low BMI group, spectral CT scan is not suggested for the relatively high dose level. In medium and large BMI group, protocol A is suggested for acquiring the same image quality without increasing dose.

CLINICAL RELEVANCE/APPLICATION
Spectral CT scan as a dual energy technique has been introduced in clinical applications and confirmed as useful in diagnosing. However, the dose of spectral CT imaging is still debated.

SSE07-04 • Radiation Dose Optimization in Abdominal Dual-source, Dual-energy CT: Assessment of Image Quality, Iodine Quantification and Low-contrast Detectability?
Matthias Benz (Presenter); Michele Pansini MD; Kovacs Bolazs; Robert Bolt; Dorothee Harder; Georg M Bongartz MD *; Zsolt Szucs-Farkas MD, PhD; Sebastian T Schindera MD *

PURPOSE
To assess the image quality, iodine quantification and low-contrast detectability in abdominal dual-source, dual-energy CT at different radiation dose levels in a phantom.

METHOD AND MATERIALS
A custom liver phantom with 43 hypodense tumors (diameters of 5, 10 and 15 mm; tumor-to-liver contrast of -10, -25, and -50 HU) and eight tubes containing solutions of varying iodine concentration (0-22 mg/ml) were placed in a cylindrical water container that mimicked an intermediate-sized patient. The phantoms were scanned with a dual-source CT scanner (Somatom Definition Flash, Siemens) using the abdominal dual-energy protocol recommended by the vendor (tube A, 100 kVp, 230 reference mAs; tube B, 140 kVp, 196 reference mAs) (protocol A). The phantoms were also scanned with three dose-optimized protocols in which the reference mAs setting of tube A was reduced by 40, 80 and 120 compared to protocol A (protocol B, C and D, respectively). The radiation dose was assessed with the volume CT dose index (CTDVol). The image noise was measured, and the contrast-to-noise ratio (CNR) of the tumors was calculated. Tumor detection was independently performed by three radiologists. Software provided by the vendor was used for iodine quantification. Kruskal-Wallis test was used to compare iodine measurements between protocols.

RESULTS
The CTDVol of protocols A, B, C and D measured 17.7, 14.6, 11.5 and 8.5 mGy, respectively. As the radiation dose decreased, the image noise increased (13.2, 14.4, 16.7 and 19.4 HU for protocol A, B, C and D, respectively) and the CNR decreased (4.4, 3.8, 3.1, and 2.7 for protocol A, B, C and D, respectively) (P < 0.05). The overall sensitivity for tumor detection measured 82.2%, 82.2%, 81.4% and 79.8% (P = 0.789). Quantitative iodine measurements showed no significant difference in the four protocols (P = 0.996).

CONCLUSION
The radiation dose of the abdominal dual-energy CT protocol that is provided by the vendor can be reduced by at least 50% while maintaining low-contrast detectability and accuracy in iodine quantification. Image noise and CNR is not an adequate surrogate for evaluating the potential for radiation dose reduction.

CLINICAL RELEVANCE/APPLICATION
The radiation dose-optimized abdominal dual-source, dual-energy CT protocol improves patient safety without degradation of diagnostic accuracy.

SSE07-05 • Reduction of Total Iodine Dose by Using Low Tube Voltage and High Tube Current Technique in Combination with Adaptive Statistical Iterative Reconstruction for Dynamic CT of the Liver
Yoshihumi Noda MD; Satoshi Goshima MD, PhD; Hiroshi Kawada MD; Haruo Watanabe MD; Hiroshi Kondo MD; Masayuki Kanematsu MD; Nobuyuki Kawai MD (Presenter); Yukichi Tanahashi MD; Kyongtae T Bae MD, PhD *

PURPOSE
To prospectively compare a low tube voltage (80-kVp) with a conventional (120-kVp) CT protocol for contrast enhancement degree of vascular and liver parenchyma, image quality, and detectability of hepatocellular carcinomas (HCCs).

METHOD AND MATERIALS

Page 1 of 258
Institutional review board approval and written informed consent was obtained. During a 9 months period, 170 patients (114 men, 56 women, age range 40-85 years, mean age 67.7 years) with suspicious having liver disease were randomized into three groups according to the following iodine-dose per body-weight protocols: 600 mgI/kg (600 mg of iodine per kilogram) at 120-peak kilo voltage (kVp) (Group 1), 500 mgI/kg at 80-kVp (Group 2), and 400 mgI/kg at 80-kVp (Group 3). One way analysis of variance were conducted to evaluate differences in CT number, back ground noise, signal-to-noise ratio (SNR), DLP, effective dose (ED), HCC-to-liver contrast-to-noise ratio (HLC), and figure of merit (FOM). Receiver operating characteristic (ROC) curves were fitted to blinded observer's confidence ratings for the presence of HCCs. Sensitivity, specificity, and area under the ROC curve (AUC) were compared to assess the detectability of HCCs.

RESULTS
64 hypervascular HCCs (mean size, 16.8 mm; range, 6.0-88.0 mm) were identified in 35 patients (27 men, 8 women, mean 69.5 years, age range 51-85 years). Compared with group 1 and 3, group 2 demonstrated significantly higher contrast enhancement and SNR of the aorta in hepatic arterial phase (P < .001), portal vein (P < .001) and hepatic vein (P < .001) in portal venous phase (PVP), and liver parenchyma in all phases (P < .001). In group 2, HLC (P = .004) and FOM (P = .001) obtained in equilibrium phase were significantly superior to those in other groups. Sensitivity, specificity, AUC for detection of HCC, and image quality were comparable among three groups. The effective dose during HAP was lower in group 1 (3.3 ± 1.2 mSv) than in group 2 (3.8 ± 1.6 mSv) and 3 (4.1 ± 1.5 mSv) (P = .025).

CONCLUSION
Use of 400 mgI/kg at 80-kVp tube voltage demonstrated comparable image quality and detectability of HCC to conventional protocol of 600 mgI/kg at 120-kVp, while the use of 500 mgI/kg at 80-kVp showed better enhancement degree and HLC.

CLINICAL RELEVANCE/APPLICATION
Our study demonstrated the possibility of the iodine-dose reduction in 80-kVp CT imaging of the liver. This information is useful for designing clinical protocols for hepatic CT imaging.

SSE07-06 • Liver CT with Low Tube Voltage and Model-based Iterative Reconstruction (MBIR) Algorithm for Hepatic Vessel Evaluation in Living Liver Donor Candidates

Bo Yun Hur (Presenter); Jeong-Min Lee MD *; Ijin Joo MD *; Joon Koo Han MD; Byung Ihn Choi MD, PhD *

PURPOSE
To investigate the image quality and diagnostic confidence of Model-based Iterative Reconstruction (MBIR) algorithm for evaluation of hepatic vessels on low-tube-voltage (100-kVp) liver donor CT.

METHOD AND MATERIALS
Fifty-one consecutive low-tube-voltage liver CT for liver donor work-up were reconstructed using FBP, adaptive statistical iterative reconstruction (ASIR), and MBIR and were compared with each other and thirty high-tube-voltage (120-kVp) liver donor CT scans reconstructed using FBP. Weighted volume CT dose index and dose-length product, mean image noise, and contrast-to-noise ratios (CNRs) were assessed. Two radiologists evaluated the image quality and diagnostic confidence on the different image sets.

RESULTS
In low-tube-voltage CT, a significant dose reduction was obtained compared with that in high-tube-voltage CT (p=.001). The image noise on MBIR images was significantly lower and CNRs on MBIR images were higher compared with those on FBP and ASIR images of low-tube-voltage CT (p<.001).

CONCLUSION
Low-tube-voltage liver CT using MBIR algorithm may increase the image quality and improve the diagnostic confidence for hepatic vessel evaluation at a reduced radiation dose compared with high-tube-voltage CT with FBP.

CLINICAL RELEVANCE/APPLICATION
Low-tube-voltage CT using MBIR could be recommended to liver donors for preoperative hepatic vessel evaluation because of improved image quality and diagnostic confidence with reduced radiation dose.

ISP: Gastrointestinal (Oncology: Staging and Distant Metastases)

Monday, 03:00 PM - 04:00 PM • E353C

SSE08 • AMA PRA Category 1 Credit ™:1 • ARRT Category A+ Credit:1

Moderator

Tracy A Jaffe MD

Moderator

Brian C Lucey MBCh

SSE08-01 • Gastrointestinal Keynote Speaker: Imaging and Cancer Staging-Present and Future

Tracy A Jaffe MD (Presenter)

SSE08-03 • Integrated Whole Body PET/MR for Evaluation of Abdominal Malignancies: Does It Really Add Clinical Value Compared with Contrast-enhanced Body CT Scans?

Beomsik Kang (Presenter); Jeong-Min Lee MD *; Yong Sub Song MD; Joon Koo Han MD; Byung Ihn Choi MD, PhD *

PURPOSE
To evaluate the added value of combined positron emission tomography (PET) and magnetic resonance (MR) imaging (PET/MR) in diagnostic performance in patients with abdominal malignancy compared to that of conventional contrast-enhanced body CT examinations.

METHOD AND MATERIALS
Between October 2012 and March 2013, 77 patients who had history of abdominal malignancy underwent 18-FDG PET/MR and conventional body CT in our institution. Imaging analysis was performed to verify added values of PET/MR compared to conventional body CT for detection and characterization of abdominal tumors as well as staging. Added value of PET/MR was defined as follows: 1. Further characterization of the lesion which had been found on CT image; 2. Added detection of distant metastasis or lymph node metastasis which had not been detected on CT image; 3. Change of preoperative staging of disease. In addition, quality of image registration was subjectively assessed in a three point scale: 1: poor; 2: average; and 3: excellent. In 10 patients, patients already had their PET/CT scan performed immediately before undergoing the PET/MR examination.

RESULTS
In all patients, PET/MR examinations from head to proximal thigh were obtained within 25-35 minutes and additional dedicated MR examinations including dynamic MR imaging and diffusion weighted imaging took additional 20 minutes. In all patients except 1 patient (98.7%), quality of image registration was excellent or at least average. Overall added values of PET/MR were observed in 24 patients (31.2%). In detail, added values of MRI were observed at 13 patients (16.9%) and added values of PET were observed at 21 patients (27.3%). Further characterization of CT-detected lesions were made in 15 patients (19.5%), detection of new lesions in 5 patients (6.5%) and change of stage in 4 patients (5.2%). SUV values of the malignant tumors and the major organs on PET/MR were slightly lower than those on PET/CT.
CONCLUSION
Compared to conventional body CT, PET/MR imaging provides added value in further characterization of the lesions, detection of distant metastasis or lymph node metastasis and staging of malignancy at abdominal malignancy patients.

CLINICAL RELEVANCE/APPLICATION
PET/MR could be obtained within 1 hour, maximize diagnostic information and provide additional value for characterization and detection of abdominal malignancies, and staging compared to body CT scan.

**SSE08-04 • Colorectal Cancer Staging: Comparison of Whole-body Hybrid MR/PET and PET/CT Imaging**

**Purpose**
To compare the lesion detection performance and SUV measurement accuracy of whole-body hybrid MR/ PET with PET/CT in patients with colorectal cancer (CRC).

**Method and Materials**
In this prospective IRB approved study, 15 consecutive patients with CRC underwent whole-body hybrid FDG PET/CT (Gemini TF, Philips) and same day MR/PET (Biograph mMR, Siemens). PET/CT and MR/PET studies were independently evaluated by two readers. Attenuation correction of MR/PET images was performed with Dixon sequences. The tumor with the highest FDG uptake (primary cancer or metastases) -to-liver SUV ratios were calculated and compared between PET/CT and MR/PET.

**Results**
Hybrid MR/PET imaging provides all the diagnostic benefits in the assessment of the CRC patients with the benefits of superior local staging, nodal staging and accuracy in comparison to PET/CT.

**Clinical Relevance/Application**
MR/PET might represent a very promising and innovative technique for accurate staging of CRC patients.

**SSE08-05 • Comparison between MRI, CT and PET-CT for Lymph Node Staging in Patients with Squamous Cell Carcinoma of Anorectum and Anal Verge**

**Purpose**
To compare T2 weighted imaging on MRI with contrast-enhanced CT with PET-CT and biopsy for lymph node staging in squamous cell carcinoma of anorectum and anal verge

**Method and Materials**
35 patients with histologically confirmed squamous cell carcinoma of anorectum and anal verge with available MRI and contrast-enhanced CT prior to PET-CT and biopsy were identified from the database.

10 lymph node stations were identified: inguinal (x2), internal iliac (x2), external iliac (x2), common iliac (x2), perirectal (x1) and paraaortic (x1). Based on signal characteristics on T2 weighted images of lymph node stations and the primary tumor and lymph node size nodes were classified into malignant and benign with different sets of criteria. Similarly, nodal stations were staged on contrast-enhanced pelvic CT based on size and different density criteria.

Reference test comprised of histopathology whenever available, otherwise FDG-PET/CT with Max SUV = 2.5.

**Results**
The best set of criteria for assessment of lymph node staging was obtained by CT based on any of the following criteria:

1. Lymph short axis diameter = 2 times the largest reported normal size
2. Clear sign of necrosis
3. Density of the node = the primary tumor

With these criteria a sensitivity and specificity of 100% was achieved on CT. Non-enhanced MRI achieved significantly less promising results than CT (p < 0.01).

**Conclusion**
Contrast-enhanced CT can identify all pelvic nodes that are deemed malignant on FDG-PET/CT in patients with squamous cell carcinoma of anorectum and anal verge. This might reflect increased flow seen in metabolically active tumors as seen on PET/CT. Non-enhanced MRI cannot achieve the same good results.

**Clinical Relevance/Application**
Contrast-enhanced CT is sufficient for lymph node staging in squamous cell carcinoma of anorectum and anal verge, decreasing the need for biopsy and PET/CT while MRI without contrast is insufficient.

**SSE08-06 • Does PET/CT Derived Tumor Heterogeneity and Glucose Uptake Predict Survival in Primary Colorectal Cancer Patients?**

**Purpose**
To investigate the prognostic value of FDG PET and CT textural analysis (CTTA) in determining overall survival in primary colorectal cancer.

**Method and Materials**

3 patients were lost to follow up leaving 126 for analysis (79-males; 47-females; mean-age 62.6±10·6y). 39 (31.0%) patients died during follow-up. Univariate analysis revealed that textural heterogeneity (p=0.012) and tumor clinical stage (p=0.003) predicted survival but SUVmax or size did not. Using multivariable analysis, tumor computed tomography textural heterogeneity (p=0.026) and stage (p independent survival predictors).

**Conclusion**
Using a cross validation model, tumor heterogeneity as measured on CT is shown to be a survival factor for patients with primary colorectal cancer, independent of clinical stage.

**Clinical Relevance/Application**
Given that performing textural analysis is simple and could be easily adopted into clinical workflow, it
would have potential management implications for primary colorectal cancer patients.

**Gastrointestinal (Cirrhosis and Portal Venous Hypertension)**

**Monday, 03:00 PM - 04:00 PM ● E451A**

**SSE09-01 ● Hepatic Function Assessment by Quantitative T1 Mapping of the Liver on Gadoxetic Acid Enhanced Magnetic Resonance Imaging**

**Jeong Hee Yoon** MD (Presenter); **Jeong-Min Lee** MD *; **Minyoung Paek**; **Berthold Kiefer** PhD *; **Joon Koo Han** MD; **Byung Ihn Choi** MD, PhD *

**PURPOSE**
To determine whether magnetic resonance (MR) relaxometry of T1 in the liver can differentiate normal liver parenchyma from liver cirrhosis stratified by the Child-Pugh (CP) score.

**METHOD AND MATERIALS**
This retrospective study was approved by institutional review board and informed consent was waived. One hundred eight patients (M:F=34:74, age range 26-76) underwent T1 relaxometry using modified Look-Locker inversion recovery (MoLLI) sequence before and 20 minutes after Gd-EOB-DTPA injection at 3T. T1 relaxometry was performed in a single breath-hold, and repeated three times at the different levels (upper than portal, portal, and below portal hilum level). Signals were measured at the three levels, carefully avoiding vessels and focal lesions, and the mean values were taken. Patients were divided into three groups: normal liver function (n=30), liver cirrhosis (LC) with CP A (n=65), LC with CP B (n=11) and LC with CP C (n=1), except one patient with severe iron deposition (CP B, n=1). T1 relaxation times of precontrast and postcontrast relaxometries among the groups were compared with each other.

**RESULTS**
On postcontrast T1 relaxometry, CP B group showed significantly longer T1 relaxation time (509.27±128.7 msec) than CP A (339.43±103.7 msec) and normal liver function (291.6±73.0 msec) groups (p<0.05).

**CONCLUSION**
MR T1 relaxometry of the liver parenchyma on Gd-EOB-DTPA enhanced MR may have potential to estimate liver function.

**CLINICAL RELEVANCE/APPLICATION**
T1 relaxation times may assess liver function quantitatively, by objectively assessing Gd-EOB-DTPA uptake of the liver.

**SSE09-02 ● The Feasibility of Texture Analysis Using Susceptibility-weighted Magnetic Resonance Imaging in Detecting Patients with Liver Cirrhosis**

**Diana S Feier** MD (Presenter); **Thomas Knogler** MD; **Marius E Mayerhoefer** MD, PhD; **Csilla Balassy** MD; **Ahmed Ba-Ssalamah** MD

**PURPOSE**
To establish the feasibility of textural features of liver parenchyma obtained on susceptibility weighted magnetic resonance imaging (SWI MRI) which will enable the detection of liver cirrhosis in patients with diffuse chronic liver diseases (CLD).

**METHOD AND MATERIALS**
Six out of ten texture features were derived from grey-level histogram. Of the 65 patients included, 62 (95.38%) were classified correctly by k-NN. Sensitivity was 96.3% and specificity was 94.7%.

**RESULTS**
Texture features extracted from the grey-level histogram calculated form SWI MRI data are feasible to correctly identify cirrhotic changes in liver parenchyma of patients with CLD.

**CLINICAL RELEVANCE/APPLICATION**
Although it proved to be a feasible method, further studies are necessary to determine whether the SWI texture analysis features are able to differentiate between severity scores of liver cirrhosis.

**SSE09-03 ● Dynamic Gadoxetic Acid-enhanced MR Imaging of the Rat Liver: Correlation between Functional MR Parameters and Hepatocyte Organic Anion Transporter Function in Cirrhosis**

**Matthieu Lagadec** MD; **Maxime Ronot** MD (Presenter); **Sabrina Doblas** PhD; **Celine Giradeau** PhD; **Jean-Luc Daire** PhD; **Simon Lambert**; **Magali Fasseu**; **Valerie Paradis** MD; **Richard Moreau** PhD; **Bernard E Van Beers** MD, PhD

**PURPOSE**
To assess the value of enhancement and pharmacokinetic parameters measured at dynamic gadoxetate-enhanced MR imaging in the determination of hepatic organic anion transport function in rat liver cirrhosis.

**METHOD AND MATERIALS**
Institutional animal review board approval was received prior to the start of the study. Carbon tetrachloride induced liver cirrhosis was obtained in 21 rats. Nine normal rats were used as control. Dynamic gadoxetate-enhanced MR images of the liver were obtained during one hour after injection of 0.025mmol/kg gadoxetate. Enhancement parameters (maximal enhancement, time to peak and elimination half-life) were measured on the enhancement versus time curves and pharmacokinetic parameters (hepatic extraction fraction and mean residence time) were obtained after deconvolution analysis of the concentration versus time curves in the liver and the portal vein. The parameters were correlated with simple and multiple regression analysis to the expression of the hepatic anion uptake transporter Oatp1a1, hepatobiliary transporter Mrp2, and backflux transporter Mrp4 determined with real time polymerase chain reaction.

**RESULTS**
In rats with cirrhosis, the maximal enhancement and time to peak decreased significantly relative to control rats, whereas the elimination half-life increased significantly. Similarly, the hepatic extraction fraction decreased and the mean residence time increased significantly. Several enhancement and pharmacokinetic parameters correlated significantly with the transporter expression at simple regression analysis (p < 0.05). At multiple regression analysis, only the hepatic extraction fraction correlated significantly with the expression of Oatp1a1 and Mrp2 with r values > 0.7, as did the mean residence time with Mrp4. The respective values were p < 10-4, r = 0.744; p < 10-4, r = 0.911, and p = 0.001, r = 0.921.
CONCLUSION
The pharmacokinetic parameters, hepatic extraction fraction and mean residence time, determined at dynamic gadoxetate-enhanced MR imaging, are markers of the changes of hepatic organic anion transporter expression in liver cirrhosis.

CLINICAL RELEVANCE/APPLICATION
DHCE-MRI has the potential to assess hepatocyte transporter function in liver cirrhosis.

SSE09-04 • Utility of Dynamic and Hepatobiliary Phase Gadoxetate-enhanced MRI for Characterization of T1-w Hyperintense Lesions in Cirrhosis. Do Challenges Exist?

Ka-Kei Ngan MD (Presenter) ; Jing Luo ; Michael Nalesnik MD * ; Keyanoosh Hosseinzadeh MD *

PURPOSE
To evaluate gadexetate-enhanced DCE-MRI for detection of hepatocellular carcinoma (HCC) in cirrhotic patients with incidentally discovered T1-w hyperintense lesions.

METHOD AND MATERIALS
Chart review of cirrhotic patients with gadoxetic-enhanced MRI at 1.5T from 2008-2012 was performed. Patients with histologically confirmed hyperintense lesions on precontrast T1-w imaging were included. Lesion size, location, T1-w, T2-w, dynamic and hepatobiliary (HB) phase signal intensity were recorded independently by two radiologists. A 4 point confidence scale classified the lesions: 1=definitely benign, 2=probably benign, 3=probably malignant, and 4=definitely malignant. Each lesion was scored based on precontrast and dynamic phase ("dynamic"), and then with the addition of the HB phase ("dynamic and HB"). Discrepancies were resolved by consensus. Scores 1 and 2 were grouped into "benign" and 3 and 4 as "malignant", and diagnostic performance comparing "dynamic" and "dynamic and HB" phases was performed. Fisher’s exact test evaluated the correlation between HB phase and histopathology. Kappa coefficients were calculated to quantify inter-observer agreement for each imaging phase and the final diagnosis. Bootstrap resampling was used to compare benign and malignant lesion sizes.

RESULTS
There were 42 pathologically confirmed lesions (15 wd-HCC, 4 mod-diff HCC, 3 dysplastic nodules, 20 regenerative nodules) in 20 patients. Based on consensus data, combining dynamic and HB phase did not change diagnostic performance compared to dynamic phase only with sensitivity and specificity of 0.74 and 0.78. Inter-observer agreement was only moderate for both dynamic (0.43) and combined dynamic and HB phases (0.5). HB phase did correlate with pathology (p<0.05). Although, addition of HB phase did not improve diagnostic performance, hypointensity on HB phase correlates strongly with malignancy. No discriminatory threshold size was found.

CLINICAL RELEVANCE/APPLICATION
A hyperintense precontrast T1-w lesion that becomes hypointense on the HB phase raises high suspicion for malignancy.

SSE09-05 • Supersonic Shear Wave Elastography as a Non-invasive Tool for Determining Improvement of Portal Hypertension in Cirrhotic Patients

Seo-Youn Choi MD (Presenter) ; Woo Kyong Jeong MD ; Yong-Soo Kim MD, PhD ; Jinoo Kim ; Hye Keun Lim MD ; Dongil Choi

PURPOSE
To investigate whether it is feasible to estimate the change of hepatic venous pressure gradient (HVPG) using Supersonic shear wave elastography (SWE) in the patients with portal hypertension.

METHOD AND MATERIALS
Twenty-three consecutive patients who were diagnosed with portal hypertension (≥6 mmHg of HVPG) on initial HVPG measurement and who underwent follow-up measurement to evaluate response to treatment were enrolled in this retrospective study. Liver stiffness measurement was performed in all of the subjects, followed by HVPG measurement through transjugular catheterization on the same day. Liver stiffness was obtained intercostally, which was repeated 5 times at the same location of the right liver. The relationship between the HVPG and liver stiffness on initial measurement and on follow-up was investigated by using Pearson’s correlation test. Furthermore, we evaluated whether a change in the HVPG (ΔHVPG) was correlated with a change in the liver stiffness (ΔLS). The subjects were subdivided into two groups: those in whom the HVPG at follow-up decreased by ≥20% compared to the initial measurement (clinical improvement), and those in whom the percentage of decrease was less than 20%. The performance to determine improvement of portal hypertension was investigated using the receiver operating characteristics (ROC) curve analysis.

RESULTS
Liver stiffness was significantly correlated with HVPG at initial and follow-up measurements (r=0.501 and 0.527, respectively). The mean rate and difference of ΔLS were strongly correlated with ΔHVPG (r=0.863 and 0.707, respectively). To determine the improvement of portal hypertension, the area under the ROC curve was 0.79 of rate of ΔLS, and 0.78 of difference of ΔLS.

CONCLUSION
Supersonic SWE is feasible method to determine improvement of portal hypertension in cirrhotic patients.

CLINICAL RELEVANCE/APPLICATION
Supersonic SWE is available for evaluation of improvement of portal hypertension; therefore, can replace; conventional invasive; catheterization. Supersonic SWE is available for evaluation of improvement.

SSE09-06 • Assessment of Liver and Spleen Viscoelastic Properties Associated with Portal Hypertension Using Multifrequency Magnetic Resonance Elastography

Maxime Ronot MD (Presenter) ; Simon Lambert ; Laure Elkrief ; Pierre Emmanuel Rautou ; Didier Lebrec ; Laurent Castera ; Valerie Vilgrain MD ; Ralph Sinkus PhD ; Bernard E Van Beers MD, PhD

PURPOSE
To assess the liver and spleen viscoelastic properties associated with portal hypertension using magnetic resonance elastography (MRE) in a consecutive series of patients with chronic liver disease.

METHOD AND MATERIALS
From January to September 2012, patients with histologically proven cirrhosis and registered on the pre-transplant list of our institution were prospectively included. Clinical and biological data including presence and severity of ascites, esophageal varices (graded on an upper GI endoscopy), Child-Pugh and MELD scores were recorded. All patients underwent a transjugular hepatic venous portal gradient (HVPG) measurement (mmHg) and a MRE examination on the same week. MRE sequence (28, 56, and 84 Hz) was performed on a 1.5 T imaging scanner. Two mechanical transducers placed on both sides of the patients were used to analyze liver and spleen stiffness (FOV: 320x320, matrix: 80x80, TR/TE: var/9.21ms, 8 dynamics, acquisition time: 1 min). Complex modulus was extracted, and the elasticity (Gd) and viscosity (GI) were calculated. Correlations between the viscoelastic parameters and the clinical-biological data were performed using the Spearman coefficient test.

RESULTS
42 patients (31 males, 76%) with a mean age of 55.5 (range: 31-69) were included. Six patients (14%) were excluded due to incomplete MR examination. Cirrhosis was related to alcohol consumption (n=16) and HCV (n=9). Child score was A (n=7), B (n=13) and C (n=16). Median MELD score was 15 (range: 6-33). Median HVPG was 16 mmHg (range: 6-36). Ascites was detected in 25 patients (69%). 29 patients had esophageal varices (including 14 patients with grade 3). There was no correlation between liver elasticity or liver viscosity.
and any of the clinicobiological parameter (MELD and Child-Pugh scores, ascites, esophageal varices, and HVPG). Spleen elasticity and spleen viscosity significantly correlated with HVPG (r=0.44, p=0.02 and r=0.53, p=0.0041, respectively) but not with the other parameters (MELD and Child-Pugh scores, ascites, and esophageal varices).

CONCLUSION
The spleen viscoelastic properties assessed by MRE are correlated with the hepatic venous portal gradient in patients with chronic liver disease.

CLINICAL RELEVANCE/APPLICATION
Our results indicate that the spleen visco-elasticity assessed by MRE is related to the severity of portal hypertension, and might constitute an interesting biomarker in severe chronic liver disease.

Vascular/Interventional (Biliary/GU Interventions)
Monday, 03:00 PM - 04:00 PM • N226

SSE26 • AMA PRA Category 1 Credit ™:1 • ARRT Category A+ Credit:1

Moderator
Lindsay S Machan, MD *

Moderator
Albert A Nemcek, MD *

SSE26-01 • BPEI-ICG-delivered siRNA Targeting MMP-9: Suppression of Granulation Tissue Formation after Bare Metallic Stent Placement in a Rat Urethral Model

Eun Young Kim (Presenter) ; Ho-Young Song MD ; Sun Il Kim PhD ; Jung-Hoon Park RT ; Eun Jung Jun PhD ; Young Chul Cho BS

PURPOSE
To evaluate the efficacy of siRNA targeting MMP-9 in suppressing granulation tissue formation caused by bare metallic stent placement in a rat urethral model.

METHOD AND MATERIALS
All experiments were approved by the committee of animal research. In 20 Sprague-Dawley male rats (weight range, 300±350g), a self-expanding metallic bare stent was inserted in the urethra under fluoroscopic guidance. One group of 10 rats (group A) was treated with MMP-9 siRNA/BPEI-ICG, while the other group of 10 rats (group B) received control siRNA/BPEI-ICG treatment. All rats were sacrificed at 4 weeks. The therapeutic efficacy of the MMP-9 siRNA/BPEI-ICG complex was assessed by comparing the two results of retrograde urethrography, histological examination, and quantification of MMP-9 by zymography and western blot analysis between the two groups.

RESULTS
Stent placement was successful in all rats without a single case of migration on follow up. Retrograde urethrography performed four weeks after stent placement demonstrated significantly larger luminal diameters of the urethra within the stents in group A compared to those in group B (P = .011). Histologic analysis revealed that the average percentage of granulation tissue area (P < .001), average number of epithelial layers (P < .001), and average thickness of submucosal fibrosis (P < .001) were significantly decreased in group A compared to group B. Meanwhile, the average density of inflammatory cell infiltration did not significantly differ among the two groups (P = .184). Quantitative analysis disclosed MMP-9 levels to be lower in group A relative to group B indicating positive inhibition of MMP-9 by MMP-9 siRNA/BPEI-ICG.

CONCLUSION
MMP-9 siRNA/BPEI-ICG is effective for inhibiting granulation tissue formation after bare metallic stent placement in a rat urethral model.

CLINICAL RELEVANCE/APPLICATION
Local therapy using MMP-9 siRNA/BPEI-ICG could be utilized to decrease stent-related tissue hyperplasia.

SSE26-02 • Bioabsorbable Biliary Stent Implantation in the treatment of Benign Bilioplastic-refractory Biliary Strictures: Preliminary Experience

Giovanni Mauri MD (Presenter) ; Caterina Michelozzi ; Dario Poretti MD ; Francesco Sardanelli MD * ; Fabio Melchiorre MD ; Luca Maria Sconfienza MD, PhD ; Gianpaolo Corinalba MD ; Vittorio Pedicini MD ; Marco Tramarin MD ; Luigi Solbiati MD

PURPOSE
Benign bile duct stricture represent a non-negligible complication of several surgical procedures around the biliary tree . A novel percutaneous-implantable bioabsorbable stent has been recently developed. Our purpose was to evaluate feasibility, safety, and outcome of patients treated with a bioabsorbable biliary stent for benign biliary stenosis refractory to other treatments.

METHOD AND MATERIALS
RESULTS
Stent implantation was feasible in all cases. No immediate major or minor complications occurred. In all patients, 48 hour cholangiographic control demonstrated the good positioning of the stent, and resolution of the stenosis. In a median follow-up time of 16.5 months (25th-75th percentiles = 11-20.25 months) no further invasive treatment was needed in any patient. Three patients experienced transient episodes of cholangitis. Neither restenosis nor dilatation of the biliary tree was documented at the follow up ultrasound studies. No stent was visible at the 6 months follow-up.

CONCLUSION
Percutaneous placement of bioabsorbable biliary stents represents a new option to treat benign biliary stenoses refractory to treatment with bilioplasting. Such a technique seems to be feasible, effective, and free from major complication. Further investigations are warranted to confirm our preliminary results.

CLINICAL RELEVANCE/APPLICATION
Percutaneous placement of bioabsorbable biliary stents is feasible, effective, and free from major complications. The main advantage is that they do not need to be removed after implantation.

SSE26-03 • Biliary Intraductal Metastasis from Advanced Gastric Cancer: Radiologic and Histologic Features, and Clinical Outcomes of Percutaneous Metallic Stent Placement

Joo Yeon Lee (Presenter) ; Dong Il Gwon ; Gi-Young Ko MD ; Kyu-Bo Sung MD ; Hyun-Ki Yoon

PURPOSE
The purpose of this study is to investigate radiologic and histologic features of biliary intraductal metastasis from advanced gastric cancer in 24 patients with biliary obstruction and clinical outcomes after metallic stent placement.
In centres of excellence, interventional-radiological procedures take part in the management/prevention of the complications of pancreatic surgery, reducing the morbidity/mortality.
Percutaneous Cholecystostomy: New Route for Percutaneous CBD Stone Removal

Younggyung Shin (Presenter) ; Gyoo Sik Jung MD ; Yong Joo Kim ; Hee Kang MD

PURPOSE
To evaluate the technical feasibility and clinical efficacy of percutaneous choledocholithotomy through the percutaneous cholecystostomy tract in patients with common bile duct (CBD) stones.

METHOD AND MATERIALS
From September 2009 to February 2013, 73 consecutive patients (43 men, 30 women; age range, 30–95 years; mean age, 74 years) with CBD stone underwent percutaneous stone removal via cholecystostomy tract and cystic duct cannulation. Thirty seven patients had acute cholecystitis and thirty six patients had cholangitis. All patients could not tolerate immediate surgery due to cardiac problem (n = 35), previous cancer operation including sepsis (n = 6), pulmonary dysfunction (n = 4), diabetes mellitus (n = 13), or liver cirrhosis (n = 1). The stones were extracted through the 12-Fr sheath using a Wittich nitinol stone basket under fluoroscopic guidance. Large or hard stones were fragmented using the basket fragmentation technique. The technical and clinical success rates, as well as complications were evaluated during follow-up period.

RESULTS
CBD stones were successfully removed in 50 of 73 patients (68%). Complete stone removal was obtained with one session in 41 patients. In 9 patients, second session was required due to multiple stones (n = 8) or migration of the fragmented stone to the CHD level (n = 1). In 23 patients, stone removal via cholecystostomy tract was failed due to failure of cystic duct cannulation (n = 14), multiple CBD stones (n = 4), proximal migration of CBD stone (n = 4), and low insertion of cystic duct (n = 1). Twenty two patients required additional PTBD for successful stone removal, and the remaining one refused further procedure. Stone removal was performed in the same session or within a maximum of 12 days (mean 3 days) after the percutaneous cholecystostomy procedure under conscious sedation. The mean time for removal of cholecystostomy catheter after successful stone extractions was 4.6 days. During the mean follow-up of 131 days, no procedure related complications were seen and no symptomatic or radiologic recurrences occurred.

CONCLUSION
Fluoroscopy-guided percutaneous CBD stone removal through the percutaneous cholecystostomy route seems to be technically feasible and clinically effective.

CLINICAL RELEVANCE/APPLICATION
In CBD stone patients, percutaneous cholecystostomy tract can be a new route for CBD stone removal.

Case-based Review of Magnetic Resonance: Abdomen and Pelvis (An Interactive Session)

Monday, 03:30 PM - 05:30 PM • S100AB

MSCM24 • AMA PRA Category 1 Credit ™:2 • ARRT Category A+ Credit:2
Director
John R Leyendecker , MD

MSCM24A • Liver
Jeffrey C Weinreb MD (Presenter) *

LEARNING OBJECTIVES
1) Accurately assess and avoid pitfalls on hepatic MRI exams. 2) Identify common conditions despite atypical appearances on imaging. 3) Differentiate a variety of benign and malignant hepatic tumors on MRI.

MSCM24B • Abdomen MRI (Excluding Liver)
Elmar M Merkle MD (Presenter) *

LEARNING OBJECTIVES
1) To illustrate a variety of abdominal pathologies by presenting MR cases from clinical practice.

MSCM24C • Prostate
Katarzyna J Macura MD, PhD (Presenter) *

LEARNING OBJECTIVES
1) To review multiparametric MRI of the prostate. 2) To discuss challenges in interpretation of imaging findings.

RSNA Diagnosis Live™: Chest and Abdomen

Monday, 04:30 PM - 06:00 PM • E450A

SPDL21 • AMA PRA Category 1 Credit ™:1.5
Paul J Chang , MD *
Neety Panu , MD, FRCPC
Gregory L Katzman , MD *

LEARNING OBJECTIVES
1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT
URL

BOOST: Gastrointestinal-Anatomy and Contouring (An Interactive Session)

Tuesday, 08:30 AM - 10:00 AM • S103AB
**Acute Abdominal Vascular Diseases**

**RC312A • Aortic Branch Dissections**

Dominik Fleischmann MD (Presenter) *

**LEARNING OBJECTIVES**

1) Review the epidemiology of aortic side-branch dissections, which can occur as a complication of aortic dissection, or as isolated spontaneous dissections of the visceral or renal arteries. 2) Explain the pathophysiology of side branch malperfusion syndromes. 3) Present the key imaging features which distinguish between the two main mechanisms of side branch malperfusion: local obstruction versus inflow obstruction.

**ABSTRACT**

Dissections of aortic side branches is a common complication of Type A and Type B acute aortic dissection which substantially increases mortality. It is important to understand the pathophysiology and the two principle mechanisms of side branch malperfusion in aortic dissection: flow obstruction can be due to (A) local abnormalities, such as occlusive dissection flaps, blind ending false lumen with true lumen occlusion (‘windsock’), or frank thrombosis. Side-branch malperfusion may also occur due to (B) limited inflow: The classic situation is complete true lumen collapse in the upstream aorta, resulting in underperfusion of all downstream branches supplied by the true lumen. While local obstructions are most commonly treated by stent placement into the diseased side branch, inflow-lesions typically require surgical or endovascular repair of the upstream aorta. Spontaneous dissections of the celiac, mesenteric, or renal arteries are relatively rare events, and typically present with acute abdominal or flank pain. Dissections of side branch arteries can lead to ischemic complications or to frank rupture. Patients presenting with mesenteric or renal artery dissection require a thorough workup to identify genetic disorders (notably Ehlers-Danlos IV), inflammatory conditions (vasculitis), and other entities such as fibromuscular dysplasia and segmental arterial mediolysis (SAM).

**RC312B • Symptomatic Aneurysms**

W. Dennis Foley MD (Presenter)

**LEARNING OBJECTIVES**

1) To detail the anatomic location and clinical presentation of symptomatic aneurysms. 2) To review appropriate imaging strategies using CT angiography. 3) To emphasize physiologic support and patient monitoring while in the imaging environment. 4) To utilise appropriate anatomic and angiographic protocols for both the diagnosis of symptomatic aneurysms and surgical and endovascular planning. 5) To detail the role of 2D and 3D image processing in the emergency situation for anatomic diagnosis and treatment planning.

**ABSTRACT**

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan’s and Ehlers-Danlos syndrome and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or iliofemoral popliteal artery aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the symptomatic aneurysm is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non-invasive management with serial CT angiographic imaging will be discussed.

**RC312C • Mesenteric Ischemia**

Iain D Kirkpatrick MD (Presenter)

**LEARNING OBJECTIVES**

1) Discuss the various categories of mesenteric ischemia (arterial occlusive, embolic, venous thrombotic, and nonocclusive), and the pathophysiologic basis behind the imaging findings in each case. 2) Understand the basis behind modern CT protocols for mesenteric ischemia, particularly the biphasic examination with CT mesenteric angiography. 3) Demonstrate techniques to rapidly analyze a mesenteric CT angiographic dataset. 4) Review the CT signs of mesenteric ischemia and their sensitivity and specificity. 5) Evaluate the current literature on mesenteric ischemia and discus optimal diagnostic criteria.

**ABSTRACT**

Acute mesenteric ischemia (AMI) is a life-threatening condition said to affect up to 1% of patients presenting with an acute abdomen, and it carries a mortality rate ranging between 59-93% in the published literature. Time to diagnosis and surgical treatment are the only...
CT/PET in the Abdomen and Pelvis: How and When (How-to Workshop) (An Interactive Session)

Tuesday, 08:30 AM - 10:00 AM • E353C

RC351A • CT/PET: Value of Iodinated Contrast

Mustafa R Bashir MD (Presenter) *

LEARNING OBJECTIVES
1) To discuss standards for liver lesion reporting, using the Liver Imaging Reporting and Data System (LI-RADS).

ABSTRACT
The Liver Imaging Reporting and Data System (LI-RADS) includes a reporting template for contrast-enhanced CT and MRI, and minimum reporting standards. This talk will discuss those reporting standards and provide tips for clear and concise reporting.

CT/PET in the Abdomen and Pelvis: How and When (How-to Workshop) (An Interactive Session)

Tuesday, 08:30 AM - 10:00 AM • E353C

RC351B • CTA of Gastrointestinal Bleeding

Jorge A Soto MD (Presenter) *

LEARNING OBJECTIVES
1) To review the appropriate implementation of CT angiography in the evaluation of patients presenting with acute lower intestinal bleeding. 2) To describe the technical details that are necessary for acquiring good quality CT angiography examinations. 3) Illustrate the characteristic CT angiographic findings of active or recent bleeding with specific examples of multiple etiologies.

ABSTRACT
Acute gastrointestinal bleeding is a serious condition that may threaten a patient’s life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectives of the diagnostic evaluation. Implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as the inability to precisely localize the source of bleeding and determine its cause. Properly performed and interpreted CT angiography examinations offer logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

HCC Diagnosis Using LI-RADS (An Interactive Session)

Tuesday, 08:30 AM - 10:00 AM • E353B

RC329 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5

RC329A • MRI features

Benjamin M Yeh MD (Presenter) *

LEARNING OBJECTIVES
1) Review underlying clinical scenarios that predispose patients to develop hepatocellular carcinoma. 2) Understand typical imaging appearances at MR imaging such that when characteristic imaging features are seen in the correct clinical setting, we can be certain that the diagnosis is hepatocellular carcinoma. 3) Describe variant features and secondary signs that are either suggestive of, or argue against, the diagnosis of hepatocellular carcinoma.

ABSTRACT
We will review LI-RADS categories, and criteria for classification by means of clinical cases. Classic and atypical cases will be presented with audience participation to reinforce the LI-RADS algorithm.

RC329B • LI-RADS Principles

Cynthia S Santillan MD (Presenter)

LEARNING OBJECTIVES
1) To familiarize radiologists with the Liver Imaging Reporting and Data System (LI-RADS) and its associated lexicon, atlas, and reporting recommendations. 2) To review the categories for liver observations in LI-RADS. 3) To demonstrate how to access and use the algorithm for determining the category of a liver observation.

ABSTRACT
We will review LI-RADS categories, and criteria for classification by means of clinical cases. Classic and atypical cases will be presented with audience participation to reinforce the LI-RADS algorithm.

RC329C • LI-RADS Cases

Reena C Jha MD (Presenter) *

LEARNING OBJECTIVES
We will review LI-RADS categories, and criteria for classification by means of clinical cases. Classic and atypical cases will be presented with audience participation to reinforce the LI-RADS algorithm.

ABSTRACT
We will review LI-RADS categories, and criteria for classification by means of clinical cases. Classic and atypical cases will be presented with audience participation to reinforce the LI-RADS algorithm.

RC329D • Reporting LI-RADS Results

Mustafa R Bashir MD (Presenter) *

LEARNING OBJECTIVES
1) To discuss standards for liver lesion reporting, using the Liver Imaging Reporting and Data System (LI-RADS).

ABSTRACT
The Liver Imaging Reporting and Data System (LI-RADS) includes a reporting template for contrast-enhanced CT and MRI, and minimum reporting standards. This talk will discuss those reporting standards and provide tips for clear and concise reporting.
Density of normal pancreas on arterial phase averaged 222.2 HU using 80 kVp acquisition energy at 8 mL/s IV contrast injection rate.

RESULTS

= worst, 4 = best).

signal-to-noise (SNR) and contrast-to-noise (CNR) compared on images processed with FBP, ASIR, and MBIR. Three experienced (> 7 yrs) abdominal radiologists independently compared overall image quality and lesion conspicuity (key finding) between FBR, ASIR, and MBIR on a scale from 0-4 (0 = worst, 4 = best).

ABSTRACT

Diagnostic accuracy of FDG-PET/CT scans can be degraded by potential technical artifacts during imaging acquisition as well as interpretive pitfalls encountered when evaluating regions of tracer accumulation. Technical artifacts occur relatively frequently due to the complexity of the PET and CT image acquisition and reconstruction; examples of important artifacts will be presented, along with potential solutions. Thoughtful design of PET/CT imaging protocols and attention to detail during image acquisition can reduce the incidence of artifacts. In addition, interpretive pitfalls due to false positive and false negative FDG accumulation is a major source of angst in interpreting oncologic PET/CT studies. Examples of common interpretive pitfalls will be presented along with approaches to distinguish malignant from benign FDG accumulation.

Gastrointestinal Series: Pancreas - Inflammation and Neoplasm

Tuesday, 08:30 AM - 12:00 PM • N230

VSGI31-01 • Cutting-edge Imaging of the Pancreas

LEARNING OBJECTIVES

1) Describe state of the art imaging modalities in diagnostic imaging of pancreatic diseases. 2) Illustrate diagnostic imaging findings useful for the differential diagnosis between pancreatic adenocarcinoma and non-neoplastic mimickers such as autoimmune pancreatitis and para-duodenal pancreatitis. 3) Understand the physiology of secretin and its application during secretin-enhanced Magnetic Resonance Cholangiopancreatography (MRCP). 4) Indication to secretin-enhanced MRCP its role in different clinical settings.

ABSTRACT

New diagnostic imaging modalities are applied in pancreatic diseases such as contrast-enhanced ultrasound, computed tomography (CT) perfusion, diffusion-weighted imaging and secretin-enhanced Magnetic Resonance Imaging (MR) imaging. These new diagnostic imaging modalities are helpful in different medical needs in pancreatic imaging such as the early diagnosis of pancreatic adenocarcinoma, differential diagnosis between pancreatic adenocarcinoma and non-neoplastic mimickers such as focal autoimmune pancreatitis and para-duodenal pancreatitis. MR imaging and MR cholangiopancreatography (MRCP) are useful in the diagnosis of cystic pancreatic neoplasms and in their characterization, by depicting internal features and the relationship between the neoplasm and the pancreatic duct system. Furthermore secretin-enhanced MR cholangiopancreatography (S-MRCP) is able to investigate ductal system abnormalities, such as those occurring in recurrent acute pancreatitis, chronic pancreatitis and acute pancreatitis. S-MRCP s also able to determine pancreatic exocrine reserve in severe chronic pancreatitis or in post-operative patients.

VSGI31-02 • Does Model Based Iterative Reconstruction (MBIR with VEO) Improve State-of-the-Art CT of the Pancreas at 80 kVp and 8 mL/s?

LEARNING OBJECTIVES

1) Discuss the role of iodinated contrast as a complement to FDG-PET/CT. 2) Discuss appropriate/efficient utilization of PET/CT relative to routine CT or MR.

RC351B • CT/ PET: Metabolic Assessment in Reporting

LEARNING OBJECTIVES

1) Discuss the role of metabolic parameters in response assessment using FDG-PET/CT. 2) Compare the use of anatomic and metabolic response evaluation systems in the evaluation of patients with malignancy.

RC351C • Artifacts/Pitfalls/Incidentals

LEARNING OBJECTIVES

1) Recognize and address common benign findings on FDG-PET / CT scans that can simulate malignancy. 2) Understand technical factors that can influence interpretation and quantification of FDG-PET studies.

ABSTRACT

The implementation of PET and PET/CT in the clinical setting for the evaluation of cancer patients has increased significantly over the past 2 decades. Several important technical factors and pitfalls related to image acquisition and interpretation have been described. The purpose of the current presentation is to review and classify these technical factors and pitfalls related to PET/CT imaging of the pancreas.

RC351D • Select Issues in Abdominal and Pelvic CT/PET

LEARNING OBJECTIVES

1) To know the indications for PET/CT in pelvic malignancy. 2) To recognize the typical findings on FDG-PET/CT in pelvic malignancies, including gynecologic and urologic cancers. 3) To be aware of some new tracers that are being used in pelvic malignancy.
Density of normal pancreas on arterial phase averaged 222.2 HU using 80 kVp acquisition energy at 8 ml/s 1V contrast injection rate.

MBIR statistically improved SNR and CNR compared to ASIR and FBP (p

**CONCLUSION**

**MBIR significantly improved quantitative and qualitative measures of over all image quality and key findings related to pancreatic neoplasm. We achieved substantially greater enhancement of the pancreas than what has been reported previously by combining the advantages of a reduced acquisition energy 80 kVp and maximized iodine flux from injecting at 8 ml/s. Coupled with MBIR, this CT technique provides better images to evaluate pancreatic neoplasm.**

**CLINICAL RELEVANCE/APPLICATION**

MBIR on images acquired at 80 kVp at maximized iodine flux sets a new standard for state-of-the-art pancreatic imaging, providing better images to discern pancreatic neoplasm.

**VSGI31-03 • Studies of Multi B-values DWI in Assessing Chronic Pancreatitis at 3.0T MR**

**Chunshu Pan MD (Presenter) ; Li Wang ; Jianping Lu MD ; Chao Ma**

**PURPOSE**

To assess the value of multi b-values DWI using biexponential model for diagnosis chronic pancreatitis. To investigate the value of parameters derived by biexponential model and monoeXponential model in evaluating the atrophy of chronic pancreatitis.

**METHOD AND MATERIALS**

48 patients with chronic pancreatitis and 36 healthy volunteers underwent DWI with 9 b-values up to 1000 s/mm² on 3.0T MR system. ADClot and D, D, f was calculated by monoeXponential model and biexponential model respectively. Atrophy rate was determined by the maximum diameter of the duct divided by the average diameter of the pancreas. Mann-Whitney U test was used for comparing the difference of ADClot, D, D, f between chronic pancreatitis and normal pancreas. Dependency of D, D, f on atrophy rate was characterized by using a Spearman rand-order correlation test.

**RESULTS**

**CONCLUSION**

**CLINICAL RELEVANCE/APPLICATION**

Multi b-values DWI could be helpful to assess the degree of fibrosis of chronic pancreatitis and pancreatic blood supply.

**VSGI31-04 • Pancreatic Cancer**

**Koenraad J Mortele MD (Presenter)**

**LEARNING OBJECTIVES**

1) To review the imaging features that allow diagnosis, staging, and management of pancreatic cancer.

**ABSTRACT**

Ductal pancreatic adenocarcinoma accounts for nearly 95% of all malignant pancreatic neoplasms and is the ninth most common malignancy. Prognosis is poor with a 5-year survival rate ranging from 1% to 5%. The majority of tumors are located in the pancreatic head and because of the involvement of the common bile duct, they present earlier than tumors arising in the body or tail of pancreas. MDCT is the imaging modality of choice for the detection and preoperative staging of pancreatic cancer.; On contrast-enhanced MDCT images, adenocarcinomas present as hypoattenuating lesions with respect to the surrounding normal pancreatic parenchyma. There are also some indirect signs for the presence of a tumor on CT without identification of the tumor itself. Maximum tumor conspicuity can be achieved using either the pancreatic parenchymal (40 seconds) or portal venous phases (70 seconds) of a dynamic contrast enhanced CT exam. The detection of hepatic metastases is critical in the preoperative staging of the patients since presence of metastatic foci within the liver makes the tumor unresectable. In the absence of obvious liver metastases, tumor resectability depends on the presence of local invasion or vascular invasion. In the absence of obvious liver metastases, tumor resectability depends on the presence of local invasion or vascular involvement. In a recent prospective study comparing EUS, CT, MRI and angiography in preoperative staging and tumor resectability assessment of pancreatic cancer, Soriano et al. reported that CT is the mainstay for pancreatic cancer staging, with the best figures in the evaluation of extent of primary tumor, locoregional extension, vascular invasion, and metastatic spread (with accuracies 73%, 74%, 83% and 88%, respectively).

**VSGI31-05 • Post-Whipple Imaging Surveillance in Patients with Pancreatic Ductal Adenocarcinoma: Association with Overall Survival in Multivariate Analysis**

**Azadeh Eimi MD (Presenter) ; Janet E Murphy MD, MPH ; Seyed Mahdi Abtahi MD ; Shaunagh McDermott FFRCSI ; Elkan F Halpern PhD * ; Mukesh G Harisinghani MD**

**PURPOSE**

While it is common clinical practice to routinely image patients with pancreatic ductal adenocarcinoma (PDAC) after Whipple procedure, there is no consensus that close imaging follow-up improves overall survival (OS). We evaluated the role of routine imaging in patients with PDAC following Whipple.

**METHOD AND MATERIALS**

We identified 1007 patients, who underwent Whipple for PDAC between 2005 and 2011, of whom 229 (105 F; median age 68 years) had regular postoperative clinical follow-up at our hospital. Patients were assigned to two follow-up groups based on clinical chart review; imaging-surveillance (IS) group defined as routine imaging at scheduled intervals, vs. clinical (C) group who had imaging only triggered by either change in clinical status or change in CA19-9. Follow-up was obtained through hospital and Cancer Data Registry records. Survival was calculated from date of surgery to death or last follow-up, with data censored as of March 13, 2013. Kaplan-Meier survival curves were compared using the log-rank test, and Cox regression models were used for multivariate analysis.

**RESULTS**

Patients were followed for a mean period of 24.35 months and visited every 2.44 months on average. Patients in IS group underwent significantly more imaging (4.41 vs. 2.08 scans per year, p=0.0083) but not more frequent follow-up visits. The most frequent imaging was CT of chest and abdomen at 3-4 months interval. In univariate analysis, age, gender, neoadjuvant or adjuvant treatment did not show a significant association with OS. Univariate associations with OS were detected with post-Whipple ECOG status, T-stage, N-stage, chemotherapy for metastatic disease, disease recurrence, new metastasis, and IS. In multivariate analysis, ECOG status, recurrence, and new metastasis were independent predictor of survival. Also, our predictor of interest, IS, was highly associated with longer survival in multivariate modeling, with a median OS of 30.4 vs.17.1 months for IS and C groups (log-rank p=0.002). The survival probability was 41.1% and 27.3%, respectively.

**CONCLUSION**

Routine imaging surveillance was associated with prolonged OS post-Whipple in this retrospective analysis of patients with PDAC in a multivariate model.

**CLINICAL RELEVANCE/APPLICATION**

Routine imaging follow-up after Whipple is associated with prolonged survival, a hypothesis-generating finding that should be studied prospectively and could ultimately impact surveillance guidelines.

**VSGI31-06 • Diffusion-weighted Imaging of Advanced Pancreatic Adenocarcinoma: Can Apparent Diffusion Coefficient Values Predict the Response to Chemotherapy?**
PURPOSE
Chemotherapy is the only option to improve survival and quality of life of patients affected by advanced Pancreatic Adenocarcinoma (PA). Response to treatment is difficult to assess, as tumor regression is not usually measurable earlier than 2-3 months and markers early kinetics are not reliable. We investigated the role of diffusion-weighted imaging (DWI) in predicting PA response to chemotherapy

METHODOLOGY AND MATERIALS
We studied 22 patients with unresectable PA (stage III and IV) candidates to a six-months multidrug gemcitabine-based regimen. All patients underwent baseline magnetic resonance imaging (MRI) of upper abdomen including respiratory triggered echo-planar DWI (b value: 0,600 s/mm²); 12 patients of this group were also studied with the same MRI protocol after one month of treatment. On axial images, mean Apparent Diffusion Coefficient (ADC) of the lesions were measured independently by two radiologists. Response was assessed using CT, PET-CT (Recist Criteria) performed at 6-8 months after treatment; patients who achieved partial response and stable disease were considered as Responders (R), the ones who developed progressive disease as Non-Responders (NR)

RESULTS
In our population we obtained 15 Rs and 7 NRs. Baseline lesional ADC was significantly lower in R group than in NR group (1,35±0.23 vs 1,68±0.17 x10⁻³mm²/s; p
CONCLUSION
Our preliminary results indicate that a higher baseline ADC, probably linked with the pre-treatment intratumoral amount of necrosis, is associated with worst response to treatment. Increase of ADC after one month, probably linked with chemotheraphy direct effects like membrane disruption and cytolyis, positively correlates with subsequent tumor reduction

CLINICAL RELEVANCE/APPLICATION
Quantitative DWI could probably early identify patients affected by PA not responding to chemotherapy and be a promising tool in developing new therapies and guiding therapeutic strategies

VSG131-07 • Cystic Pancreatic Tumors

Douglas S Katz MD (Presenter)

LEARNING OBJECTIVES
1) To overview the differential diagnosis of cystic lesions of the pancreas. 2) To demonstrate examples of multiple types of cystic lesions of the pancreas with an emphasis on CT and MR, but with some US correlation. 3) To review the current literature of cystic pancreatic lesions, with an emphasis on areas of controversy as well as management issues.

VSG131-08 • Incidental Pancreatic Cystic Lesions: Relationship with All-cause Mortality and Incidence of Pancreatic Neoplasm

Victoria Chernyak MD (Presenter) *; Milana Flusberg MD; Linda B Haramati MD, MS *; Alla M Rozenblit MD; Eran Bellin

PURPOSE
To assess relationship of incidental pancreatic cysts found on CT/MR and all-cause mortality, incidence of all pancreatic cancers and incidence of pancreatic adenocarcinoma (AdenoCA) and pancreatic ductal carcinoma (DCA).

METHOD AND MATERIALS
Cyst cohort included cases with CT/MR reports done between 11/1/01-11/1/11and describing incidental pancreatic cysts. No-cyst cohort was frequency-matched on age decade, modality and year of initial study from a pool of patients without reported pancreatic cysts. Cases with diagnosis of any pancreatic cancer within 5 years of initial CT/MR were excluded. 10-year cumulative incidences of any pancreatic cancer and incidences of AdenoCA/ DCA were compared between cohorts. Reports in Cyst cohort were reviewed for number of cysts, size and location of largest cyst, presence of calcification, septations, enhancing component, main pancreatic duct (MPD) dilatation, regional lymphadenopathy (LAN).

RESULTS
There were 1,343 cases in Cyst cohort and 4,015 cases in No-cyst cohort with mean age of 70.1 (±15.3) and 69.6 (±15.6) years, respectively (p=0.32). 10 year cumulative all-cause mortality was 19.1% (95% CI 13.1-24.7) in Cyst cohort and 19.1% (95%CI 15.1-22.9) in No-cyst cohort (p=0.42). 10 year cumulative incidences of all pancreatic cancers were 1.7% (95% CI 0.6-2.7) in Cyst cohort and 0.3% (95% CI 0.1-0.5) in No-cyst cohort (p
CONCLUSION
Incidental pancreatic cysts on CT/MR are associated with 5.2 times higher risk of pancreatic AdenoCA/DCA but not with increased all-cause mortality.

CLINICAL RELEVANCE/APPLICATION
Incidental pancreatic cysts do not affect all-cause mortality, but are markers of increased risk of pancreatic adenocarcinoma and ductal carcinoma.

VSG131-09 • Is Mural Nodule a Predictor for Malignancy in Patients with Intraductal Papillary Mucinous Neoplasms of the Pancreas?

Seo-Youn Choi MD (Presenter); Seong Hyun Kim; Kyung Mi Jang

PURPOSE
To evaluate whether the location and the distribution of mural nodules were important for prediction of malignancy in patients with intraductal papillary mucinous neoplasms (IPMNs) of pancreas

METHOD AND MATERIALS
This retrospective study was approved by the institutional review board and informed consent was waived. This study included 44 patients with surgically resected 44 IPMNs (23 malignancy and 21 benignancy) which had mural nodules on pathology and CT or MRI.

Qualitative (morphologic type of IPMNs, location and distribution of mural nodules, presence of solid lesion, pancreatitis, irregular thick septum, and additional cystic lesion) and quantitative (maximal diameter of main pancreatic duct, size of the largest cystic lesion and solitary mural nodule) parameters were compared between malignant and benign IPMNs using univariate and multivariate logistic regression analyses.

RESULTS
Of 23 malignant IPMNs, 17 (73.9%) had mural nodules in main duct in both main and branch duct on location, whereas 15 of 21 (71.4%) benign IPMNs had mural nodule in branch duct on location (p =0.008). Multiple or diffuse mural nodules were more frequently observed in malignant IPMNs (16/23, 69.6%) than benign IPMNs (6/21, 28.6%) (p < 0.01). The presence of pancreatitis and additional cystic lesion, maximal diameter of main pancreatic duct, size of the largest cystic lesion and solitary mural nodule were not significantly different between malignant IPMNs and benign IPMNs (p >0.05). On multivariate analysis, mural nodules in main duct type on location (odds ratio [OR] = 41.18), and multiple (OR= 34.0) or diffuse mural nodules (OR= 27.0) on distribution were identified as significant factors for prediction of malignancy in IPMNs with mural nodules.

CONCLUSION
Mural nodules in main duct and multiple or diffuse distribution of mural nodules were independent predictors of malignancy in IPMNs with mural nodules.

CLINICAL RELEVANCE/APPLICATION
**VSGI31-10 • Acute Pancreatitis**

**Desiree E Morgan** MD (Presenter) *

**LEARNING OBJECTIVES**
1) Discuss the imaging findings in patients with acute pancreatitis using the preferred nomenclature of the revised Atlanta Criteria. 2) Identify the various retroperitoneal collections associated with acute pancreatitis.

**VSGI31-11 • Is CT Useful in Patients with Acute Pancreatitis Presenting to Emergency Department?**

**Atul B Shinagare** MD (Presenter) ; **Ivan Ip** MD, MPH ; **Ali Raja** MD, MBA * ; **Vikram A Sahni** MBBS ; **Peter A Banks** ; **Ramin Khorsanani** MD *

**PURPOSE** To assess the use of CT in patients with acute pancreatitis (AP) presenting to the emergency department (ED).

**METHOD AND MATERIALS**
In this IRB-approved HIPAA-compliant retrospective study, we identified all patients with AP presenting from March 2012 through February 2013 to ED of an academic teaching hospital with approximately 60,000 annual visits. Patients were initially identified using ICD-9 code for AP (577.0) and diagnosis was then confirmed using clinical criteria from chart reviews. Based on existing literature, AP was confirmed when two of the following three were present: typical abdominal pain, elevated lipase/amylase >3 times normal and CT findings of pancreatitis. Abdominal CT scans obtained in ED or within 24 hours of admission were reviewed by a fellowship-trained abdominal radiologist.

**RESULTS**

**CONCLUSION**
CT is frequently obtained in patients with AP presenting to ED even if diagnosis can be made based on established clinical criteria of typical abdominal pain and markedly elevated labs. CT is unlikely to be useful in these patients in the acute setting, as complications of AP in this setting may be rare.

**CLINICAL RELEVANCE/APPLICATION**
Abdominal CT rarely shows complications of acute pancreatitis in the acute phase, and it may not be necessary if diagnosis can confidently be made based on typical abdominal pain and elevated labs.

**VSGI31-12 • Perfusion CT- Can It Predict the Development of Pancreatic Necrosis in Early Stage of Severe Acute Pancreatitis**

**Ajay K Yadav** MBBS (Presenter) ; **Raju Sharma** MD ; **Devasenathipathy Kandasamy** ; **Shivanand R Gamanagatti** MBBS, MD ; **Ashu Seth Bhalla** MBBS, MD ; **Deep N Srivastava** MD, MBA ; **Pramod Garg** MBBS, MD ; **Ankur Goyal** MBBS, MD ; **Sreenivas V** ; **Arun K Gupta** MBBS, MD

**PURPOSE**
Pancreatic necrosis is among the most important factors which determine the outcome of patients with severe acute pancreatitis (SAP). This prospective study was conducted to evaluate if perfusion CT can detect pancreatic ischemia at an early stage of SAP and predict the development of necrosis.

**METHOD AND MATERIALS**
Perfusion CT (PCT) was performed in 42 consecutive patients of acute pancreatitis admitted within 72 hours from the onset of abdominal pain. Twenty-two patients were classified as having SAP on the basis of APACHE II (score >8) or SIRS criteria. All patients underwent a follow-up portal venous phase CECT after 2-3 weeks to see the progression of disease and look for pancreatic necrosis. Twenty-five controls with no pancreatic pathology were also studied.

**RESULTS**
Out of 22 patients of SAP, 12 patients showed severe pancreatic perfusion defects (blood flow rate <15 mL/100g/min).

**CONCLUSION**
Perfusion CT is a reliable tool for the detection of pancreatic ischemia at an early stage of SAP and can be used to predict the development of necrosis.

**CLINICAL RELEVANCE/APPLICATION**
Perfusion CT can predict pancreatic necrosis in SAP which opens up the scope for early intervention to prevent this ominous complication.

**VSGI31-13 • Autoimmune Pancreatitis**

**Joel G Fletcher** MD (Presenter) *

**LEARNING OBJECTIVES**
1) To review the diagnostic criteria for autoimmune pancreatitis. 2) To discuss the differences between Type 1 and Type 2 autoimmune pancreatitis. 3) To emphasize the need to maximize visualization of pancreatic and intrahepatic ducts and understand temporal changes in contrast enhancement in autoimmune pancreatitis. 4) To describe imaging findings demonstrating response to treatment and recurrence of autoimmune pancreatitis after remission. 6) To describe useful imaging features in the differential diagnosis of pancreatitis versus neoplasms and other inflammatory conditions.

**VSGI31-14 • Differentiation of Focal-type Autoimmune Pancreatitis from Pancreatic Carcinoma: Assessment by Multiphase Contrast-enhanced CT**

**Naohiro Furuhashi** (Presenter) ; **Kojiro Suzuki** MD ; **Yusuke Sakurai** ; **Mitsuru Ikeda** MD ; **Yuichi Kawai** ; **Shinji Naganawa** MD

**PURPOSE**
To assess the utility of multiphase contrast-enhanced computed tomography (CT) for differentiating focal-type autoimmune pancreatitis (AIP) from pancreatic carcinoma (PC).

**METHOD AND MATERIALS**
Subjects in this retrospective study comprised 21 patients (20 men, 1 woman; mean age, 66.7 years; range, 55-79 years) with 22 focal-type AIP lesions who fulfilled International Consensus Diagnostic Criteria and/or Revised Japanese Pancreas Society criteria and 60 patients (36 men, 24 women; mean age, 65.8 years; range, 38-82 years) with 61 PC lesions who were pathologically diagnosed from surgically resected specimens. Two radiologists blinded to the final diagnosis and other examination findings independently evaluated findings from multiphase contrast-enhanced CT in each patient. Along with pancreatic findings, extrapancreatic findings for the bile duct, kidneys and lymph nodes were also evaluated. Frequencies of each finding were compared between AIP and PC. Interobserver agreement was evaluated by kappa statistic.

**RESULTS**
Homogeneous enhancement during the delayed phase (AIP, 86% vs. PC, 41%; p <.001, ? = .64) were
more frequently observed in PC. Presence of four of seven CT findings, that is, i) homogeneous enhancement during the delayed phase, ii) dot enhancement during the pancreatic phase, iii) duct penetrating sign, iv) main pancreatic duct wall enhancement, v) capsule-like rim, vi) absence of ring-like enhancement during the delayed phase and vii) absence of peripancreatic strand, offered 82% sensitivity and 95% specificity for identifying focal-type AIP.

CONCLUSION
The combination of CT findings can be helpful for differentiating focal-type AIP from PC.

CLINICAL RELEVANCE/APPLICATION
Focal-type AIP can mimic PC and responds to steroid therapy. Differentiation of these two entities might contribute to improvements in patient management.

VSGI31-15 • Autoimmunpancreatitis: Therapy Monitoring Using IVIM-diffusion MRI

Miriam Klauss MD (Presenter) ; Klaus Maier-Hein MD; Jens Werner MD, PhD *; Hans-Ulrich Kauczor MD *; Lars Grenacher MD ; Bram Stieltjes MD

PURPOSE
To evaluate diffusion imaging in autoimmune pancreatitis (AIP) before and after steroid treatment using IVIM-derived parameters.

METHOD AND MATERIALS
To date, 17 patients suspected of having an AIP underwent diffusion-MRI (1.5 T). Diffusion-weighted images were acquired using a single-shot echo-planar imaging sequence in breath-hold with the following imaging parameters: TR = 1300 ms, TE = 60 ms, FOV = 350 x 273 mm2, 14 slices, b-values = 0, 50, 100, 150, 200, 300, 400, 600 and 800 s/mm2. DW-data were post-processed using an in-house developed software. Eight patients had an AIP (n=2 resection, n=6 clinical consensus). Six patients had follow-up examinations during steroid treatment. IVIM-parameters (perfusion fraction f and perfusion free diffusion coefficient D) were extracted from manually drawn ROIs for patients with and without AIP for initial and follow-up examinations. ROIs were anatomically matched between initial and follow-up examinations. The derived parameters were tested for significant differences between healthy tissue and AIP and between initial and follow-up examinations in AIP patients using an unpaired and paired t-test respectively.

RESULTS

CONCLUSION
The diffusion-derived IVIM-perfusion fraction f is significant lower in patients with AIP, normalizes at the first follow-up examination during steroid treatment and remains constant in the second follow-up examination.

CLINICAL RELEVANCE/APPLICATION
IVIM-diffusion MRI could serve as an imaging biomarker during steroid treatment in patients with AIP.
ABSTRACT

Purpose/Objective(s): To evaluate the frequency of esophageal stenosis after radiotherapy for superficial esophageal carcinoma and its association with patient or treatment related factors.

Materials/Methods: We retrospectively reviewed 25 patients with superficial esophageal carcinoma treated by radiotherapy with curative intent at Chiba University Hospital between January 2002 and December 2012. The age of the patients ranged from 55 to 85 years old (median age 72 years). There were 23 men and 2 women. All tumors were classified according to the UICC 7th TNM staging system: 5 patients had T1a tumor and 20 patients had T1b tumor. All tumors had squamous cell carcinoma histology. Location of the lesion were as follows: cervical esophagus in 2 patients, upper thoracic in 3, mid thoracic in 7, lower thoracic in 11, abdominal esophagus in 2. Total dose of radiotherapy ranged from 50-60 GY at daily 2 Gy per fraction. Prior to radiotherapy, 8 patients with received endoscopic submucosal dissection or endoscopic mucosal resection. Six patients were treated with radiotherapy alone, while other 19 patients were treated with concurrent chemotherapy. Upper gastrointestinal endoscopy or esophagography was performed for all patients before treatment and within 3 months after completion of the radiotherapy. Post-treatment esophagographies were reviewed to calculate the stenotic ratio. The calculated stenotic ratio was then classified into the four levels: stenosis level 1, stenotic ratio of 0-25%; 2, 25-50%; 3, 50-75%; 4, 75-100%.

Results: Significant proportion of patients experience esophageal stenosis after radiotherapy for superficial esophageal carcinoma. The occurrence of grade 3-4 acute esophagitis during treatment was significantly associated with the frequency of esophageal stenosis (p=0.024). Tumor location, stage, preceding endoscopic surgery, use of chemotherapy, radiotherapy dose, and treatment response were not associated with the frequency of stenosis.

Conclusions: Esophageal stenosis occurred in 8 patients (32%), causing passage disturbance in 3 patients. The number and percentage of patients at each stenosis level were as follows: level 1: n = 17 (68%); level 2: n = 5 (20%); level 3: n = 3 (12%); level 4: n = 0 (0%).

SIGNIFICANCE/IMPLICATION

The occurrence and progression of acute esophagitis during treatment may predict post-treatment esophageal stenosis.
Gastrointestinal (Hepatic Steatosis Imaging)

Tuesday, 10:30 AM - 12:00 PM • E350

SSG06 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5
Moderator
Shahid M Hussain, MD *
Moderator
Alvin C Silva, MD
Moderator
Bachir Taouli, MD *

SSG06-01 • Slower Hepatic Metabolic Rates in NASH Patients Revealed by the Fast and Localized 31P Saturation Transfer at 7T

Siegfried Trattning MD (Presenter); Ladislav Valkovic PhD; Martin Gajdosik MSc; Stefan A Traussnigg; Marek Chmelik MS; Ivan Frollo; Michael Trauner; Martin Krassak PhD

PURPOSE
Invasive liver biopsy is the only method currently used to distinguish between relatively benign non-alcoholic fatty liver (NAFL) and potentially progressive steatohepatitis (NASH). Phosphorus magnetic resonance spectroscopy (31P-MRS) combined with saturation transfer (ST) enables non-invasive measurement of metabolic activity at rest in vivo, which is indicative for inflammatory liver diseases. Therefore the aim of this study was to test the feasibility of ST at 7T for non-invasive distinction of NAFL and NASH.

METHOD AND MATERIALS
In addition to routine MR examination of the liver with dynamic contrast enhancement (Gadoterate meglumine; Dotarem, Guerbet, France) 31P-MRS ST measurements of ten suspected NAFL/NASH patients (6m/4f, a=49.5±13.2y) were performed one day prior the liver biopsy. Additionally four healthy males (a=25.3±2.9y) were measured as controls. Examinations were performed in morning sessions after overnight fasting on a 7T MR system (Siemens Healthcare, Erlangen, Germany) using 1H/31P surface coil. The reaction rate between inorganic phosphate (Pi) and adenosine-tri-phosphate (ATP) was calculated from liver spectra acquired w/o saturation of G-ATP and the apparent longitudinal relaxation (T1app) was measured with inversion-recovery sequence with G-ATP saturation. The forward rate constant (k) and metabolic flux (F) were correlated with histology, regarding disease status and steatosis degree.

RESULTS
The patient group was resolved by the histological diagnosis into fatty liver (NAFL; n=4) and steatohepatitis (NASH; n=6) subgroups. The NASH patients had significantly lower k and F values when compared to NAFL (p=0.001) and also to healthy volunteers (p=0.002), with no overlap between the NAFL and NASH subgroups. Furthermore, the forward rate constant of the chemical exchange between Pi and ATP as determined by the ST experiment correlated well with the histologically assessed steatosis degree.

CONCLUSION
Liver Pi-ATP exchange, measured in vivo by the ST technique at 7T, is decreased in NASH in comparison to NAFL patients and controls. This is connected to the lower exchange rate constant and might provide a clinical tool for future investigations of the NASH and NAFL disease progression.

CLINICAL RELEVANCE/APPLICATION
31P-MRS ST measurement reveals differences in hepatic metabolic rates in patients with steatohepatitis and fatty liver. In the long run this technique may replace invasive liver biopsy.

SSG06-02 • Quantification of Liver Iron Overload and Steatosis at 3T

Anne Boulic (Presenter); Anita Kiani; Edouard Bardou-Jacquet; Bruno Turlin MD; Herve Saint-Jalmes PhD; Yves Gandon MD

PURPOSE
To evaluate quantification of both liver iron overload and steatosis with a multi-echo gradient echo MR sequence at 3T, compared to liver biopsy as a gold standard.

METHOD AND MATERIALS
Following consent, 105 patients (68 men and 37 women, mean age 52 years; range 18-75) needing a liver biopsy mainly for metabolic liver disease were investigated at 3T. A single breath-hold gradient-recalled echo (GRE) sequence (body coil, TR=120 ms, FA=20°) was acquired for each patient with 11 TE multiples of 1.15 ms or 1.23 ms depending on whether an Achieva (Phillips) or Verio (Siemens) system was used. Liver to muscle (L/M) signal intensity ratio and several T2* maps (overall, in-phase, out-of-phase) were calculated. An L/M algorithm based on 5 echoes was defined similarly to the one described at 1.5T. MR Fat fraction (FF) was estimated by the Dixon methods without and with the T2* correction methods. MR results were correlated with biochemical liver iron concentration (LIC) and steatosis METAVIR grade.
RESULTS
66 patients had liver iron overload ranging from 36.1 to 629 μmol/g and 37 had a steatosis grade above 20%. There was a strong linear correlation ($R^2=0.94$) between the L/M algorithm and LIC, including in heavily overloaded livers. An exponential correlation was also observed between LIC and T2* ($R^2=0.84$) up to a maximum of 150 μmol/g. Subsequently, under 2 ms, T2* became difficult to assess. FF was better correlated with steatosis grade ($R^2=0.6$) when using T2* correction methods which partially reduced the calculation errors observed in the case of combined overload. The correlation was further improved ($R^2=0.77$) by selecting patients with LIC below 150 μmol/g.

CONCLUSION
A single breath-hold GRE multi-echo sequence allows simultaneous quantification of LIC and FF. A combined evaluation is essential to avoid calculation errors. Similarly to 1.5T, an algorithm for calculating liver iron concentration at 3T has been developed.

CLINICAL RELEVANCE/APPLICATION
A single breath-hold GRE multi-echo sequence allows simultaneous and accurate quantification of liver iron overload and liver steatosis at 3T.

SSG06-03 • A Multiparametric Approach Combining T2-corrected IVIM, MR-DCE Imaging and Fat Volume Fraction Quantification to Evaluate Chronic Liver Diseases at 3.0T

Benjamin Leporq MS (Presenter); Frank Pilleul MD; Jerome Dumortier; Pierre-Jean Valette MD; Olivier Guillaud; Thibaud Lefort; Olivier Beuf PhD

PURPOSE
To evaluate a multi-parametric approach combining T2-corrected IVIM, MR-DCE imaging and a fat content quantification method for chronic liver diseases assessment at 3.0T.

METHOD AND MATERIALS
3 algorithms were developed: (i) a Fat Volume Fraction (FVF) quantification algorithm correcting for relaxation time effects using a disjuncted estimation of T1 and T2* of fat and water and accounting for the NMR spectrum of fat; (ii) an algorithm to quantify perfusion parameters including a rigid image registration procedure, an auto-calibrated tracer concentration quantification method based on a T1 precontrast mapping and a modeling step using a non-linear least square fit on a dual-input one compartment model; (iii) an algorithm to quantify IVIM parameters using a non-linear least square fit on a modified IVIM model including liver and blood T2 decays. Validations were performed on a prospective study including 14 subjects with chronic liver diseases.

RESULTS
Based on Wilcoxon's test: FVF allowed to distinguish between all histological grade of steatosis. DSlow significantly decrease in patients with steatosis without fibrosis. Hepatic perfusion index allowed to distinguish between non fibrosis, non-advanced fibrosis and advanced fibrosis. Portal and total perfusion, DFast, and mean transit time allowed to distinguish between non-advanced and advanced fibrosis. A significative correlation was found between DFast and portal perfusion or total perfusion ($\rho = 0.86$ and 0.81 respectively; $p < 0.001$).

CONCLUSION
Perfusion parameters given by MR-DCE imaging alone are relevant to evaluate fibrosis severity whereas fat overload constitute a confounding factor for fibrosis evaluation using IVIM when NAFLD and chronic hepatitis are mixed. The combination of IVIM and MR-DCE imaging do not bring additional information for fibrosis assessment in a wide spectra of etiologies. Since IVIM can give information about both hemodynamic changes and molecular diffusion restriction associated to liver fibrosis, IVIM could be a useful injection-free method to distinguish between pure steatosis and NASI in patients with NAFLD, if combined with a suitable MR fat quantification method.

CLINICAL RELEVANCE/APPLICATION
Non-invasive chronic liver disease assessment using a MR multiparametric approach.

SSG06-04 • Correlation of Quantitative Ultrasound Backscatter with 3T MRI-estimated Proton Density Fat Fraction (PDFF) for Assessment of Hepatic Steatosis

Abdullah T Alturki MD, MBBS (Presenter); Aiguo Han MS; Jessica Lam BS; Jonathan C Hooker BS; Amol Shah BS; Kevin A Zand MD; Michael S Middleton MD, PhD*; William D. O’Brien PhD; Rohit Loomba MD, MSc; Claude B Sirlin MD*; Michael P Andre PhD*

PURPOSE
To correlate quantitative ultrasound (QUS) backscatter coefficient (BSC) with 3T MRI proton density fat fraction (PDFF) as indicators of hepatic steatosis in a cohort of adults with known or suspected non-alcoholic fatty liver disease (NAFLD).

METHOD AND MATERIALS
This single site, cross-sectional, pilot study was IRB approved and HIPAA-compliant. In this study, T1-independent, T2* corrected breath-hold MRI was performed on a 3T GE Signa MR scanner to assess hepatic steatosis. Immediately before or after MRI, QUS measurements were made in the deep portion of liver segments VII–VIII using a right intercostal approach with the subject in a dorsal decubitus position and the subject’s right arm at maximum abduction. Ultrasound imaging was performed during shallow breath-hold inspiration using a mechanical index of ~1.7. A Siemens S2000 scanner with 4C1 transducer was used to record raw full-bandwidth RF signals via the research interface for offline post-processing analysis. QUS procedure time was five minutes or less. The frequency range 2.2 - 2.6 MHz was selected to compute BSC for each patient.

RESULTS
These early results are encouraging for QUS BSC potentially being able to detect early NAFLD and to monitor its progression using a simple, inexpensive ultrasound technique. Additional recruitment of subjects is anticipated to increase sample size and explore further this interesting preliminary result.

CONCLUSION
Non-invasive ultrasound that is sensitive to early stage NAFLD and capable of staging progression would be an invaluable tool for clinical care, clinical trials and drug development.

SSG06-05 • Accuracy of Spectrally-corrected MRI 2-echo and 6-echo Proton Density Fat Fraction (PDFF) in Measuring Longitudinal Hepatic PDFF Change Using MRS PDFF as Reference

Abdullah T Alturki MD, MBBS (Presenter); Tanya Wolfson MS; Jessica Lam BS; Gavin Hamilton PhD; Claude B Sirlin MD*; Michael S Middleton MD, PhD*

PURPOSE
To measure accuracy of longitudinal differences in 2-TE and 6-TE spectrally corrected MRI hepatic PDFF using MRS differences as reference.

METHOD AND MATERIALS

RESULTS
Cross-sectional and longitudinal accuracy were high for both MRI methods with MRS as reference, and PDFF differences between time points for 2-TE, 6-TE, and MRS were comparable.
CLINICAL RELEVANCE/APPLICATION
Since longitudinal 2-TE and 6-TE PDFF differences were comparable, spectrally corrected 2-TE MRI may suffice in some clinical and research settings to assess hepatic steatosis.

SSG06-06 • Quantification of Liver Fat at 3 Tesla: Intraindividual Comparison of Two Modified Dixon Techniques with MR Spectroscopic T2 Relaxometry and Histopathology

Guido M Kukuk MD (Presenter) *; Frank Traeber; Alois Martin Sprinkart MSc; Wolfgang Block; Holger Eggers PhD *; Winfried A Willinek MD *; Verena Sailer MD; Hans H Schild MD

PURPOSE
To assess the accuracy of dual-echo and multi-echo modified Dixon techniques for the in-vivo quantification of liver fat in comparison with MR spectroscopic and histopathologic determination of the fat fraction.

METHOD AND MATERIALS
RESULTS
21/43 patients had a hepatic fat fraction of more than 5% as determined by MRS, with a maximum of 47% and a mean value of 18%.
Bland-Altman analysis revealed good agreement between 6-point mDixon and MRS, with a mean difference of only 1.6% and a Pearson correlation of r=0.982 (p

CONCLUSION
2-point mDixon slightly underestimates hepatic fat fraction in comparison to 6-point mDixon, which excellently matches the results from MR spectroscopy and histopathology.

CLINICAL RELEVANCE/APPLICATION
The 6-point mDixon method allows accurate in-vivo determination of liver fat contents at 3 Tesla.

SSG06-07 • Comparison of Single Slice Low-dose and Full-dose Nonenhanced CT Protocols for Evaluation of Pathology Proven Hepatic Steatosis

Michael Y Park MD (Presenter) ; Joon-Il Choi ; Seung Hwan Lee ; Young Joon Lee MD ; Seung Eun Jung MD ; Jae Young Byun MD

PURPOSE
To determine the effects and adequacy of using a single slice low-dose nonenhanced CT protocol for evaluation of hepatic steatosis.

METHOD AND MATERIALS
The hepatic attenuation (HAT) and hepatic attenuation minus splenic attenuation difference (CTL-S) values were measured in 283 liver donor patients with liver biopsy performed during surgery. Full-dose nonenhanced CT was performed in 139 patients. Low-dose CT protocol with only a single slice including the superior segments of the liver and spleen was performed in 144 patients. Patients were divided in normal and fatty liver groups according to whether there was greater than or equal to 30% (moderate to severe) hepatic steatosis on pathological examination. The HAT and CTL-S were compared between the two protocols. Cutoff values with high sensitivity for screening the fatty liver patients were determined.

RESULTS
The median (IQR; interquartile range) of HAT was 59 (57.00~62.50) HU in the low-dose normal group and 51.33 (48.33~54.84) HU in the full-dose normal group, showing a statistically increased value (P < 0.0001) in the low-dose group. The median (IQR) of CTL-S was 7.75 (3.00~11.25) HU in the low-dose normal group and 7.63 (4.50~11.02) HU in the full-dose normal group, and did not show a statistical difference. Using a CTL-S cutoff value of less than or equal to 1 HU resulted in a 100% sensitivity, 86.03% specificity, 24% PVV, and 100% NPV for screening fatty liver patients using low-dose protocols. Using a CTL-S cutoff value of less than or equal to 1.83 HU resulted in a 100% sensitivity, 86.67% specificity, 18.2% PVV, and 100% NPV for screening fatty liver patients using full-dose protocols.

CONCLUSION
CTL-S is a more stable value than HAT for evaluation of hepatic steatosis when using differing CT dose protocols. The threshold value and efficiency for CTL-S to evaluate moderate to severe hepatic steatosis when using single slice low-dose protocols is similar to that of full-dose protocols.

CLINICAL RELEVANCE/APPLICATION
This study shows that using single slice low-dose nonenhanced CT protocols for screening of moderate to severe hepatic steatosis is feasible and can drastically reduce patient dose exposure.

SSG06-08 • Non Invasive Quantification of Hepatic Steatosis in Living, Related Liver Donors Using Dual Echo Dixon Imaging and Single Voxel Proton Spectroscopy

Sonal Krishan MD (Presenter) ; Yogesh Bathina

PURPOSE
To evaluate the diagnostic implications of hepatic fat fraction calculated using dual echo Dixon imaging and 1-H MR spectroscopy technique to detect hepatic steatosis in potential liver donors using histopathology as the reference standard.

METHOD AND MATERIALS
106 potential liver donors were included. MRI was performed on a 1.5-T scanner using a three-dimensional dual echo MRI sequence with automated reconstruction of in-phase (IP), out-of-phase (OP), fat-signal-only and water-signal-only images. Hepatic fat fraction was calculated by drawing 15 regions of interest on the IP, OP, fat only and water only images. Single voxel MR spectroscopy was performed at TEs of 30 and 20 in right as well as the left lobe of liver. Liver fat fraction was calculated from water and fat peaks. 106 biopsies were divided in normal and fatty liver groups according to whether there was greater than or equal to 30% (moderate to severe) hepatic steatosis on pathological examination. The HAT and CTL-S were compared between the two protocols. Cutoff values with high sensitivity for screening the fatty liver patients were determined.

RESULTS
The median (IQR; interquartile range) of HAT was 59 (57.00~62.50) HU in the low-dose normal group and 51.33 (48.33~54.84) HU in the full-dose normal group, showing a statistically increased value (P < 0.0001) in the low-dose group. The median (IQR) of CTL-S was 7.75 (3.00~11.25) HU in the low-dose normal group and 7.63 (4.50~11.02) HU in the full-dose normal group, and did not show a statistical difference. Using a CTL-S cutoff value of less than or equal to 1 HU resulted in a 100% sensitivity, 86.03% specificity, 24% PVV, and 100% NPV for screening fatty liver patients using full-dose protocols.

CONCLUSION
CTL-S is a more stable value than HAT for evaluation of hepatic steatosis when using differing CT dose protocols. The threshold value and efficiency for CTL-S to evaluate moderate to severe hepatic steatosis when using single slice low-dose protocols is similar to that of full-dose protocols.

CLINICAL RELEVANCE/APPLICATION
This study shows that using single slice low-dose nonenhanced CT protocols for screening of moderate to severe hepatic steatosis is feasible and can drastically reduce patient dose exposure.

SSG06-09 • Combined Use of Magnetic Resonance Fat Quantification and Magnetic Resonance Elastography in Liver Living Donors: Can It Reduce Need for Preoperative Liver Biopsy?

Jeong Hee Yoon MD (Presenter) ; Jeong-Min Lee MD * ; Inpyeong Hwang MD ; Joon Koo Han MD ; Byung Ihn Choi MD, PhD *

PURPOSE
To evaluate the diagnostic implications of hepatic fat fraction calculated using dual echo Dixon imaging and 1-H MR spectroscopy technique to detect hepatic steatosis in potential liver donors using histopathology as the reference standard.
To determine whether combination of magnetic resonance (MR) fat quantification tools and MR elastography (MRE) can reduce the necessity of preoperative liver biopsy (LB) in living donor candidates.

METHOD AND MATERIALS
This retrospective study was approved by institutional review board and informed consent was waived. From January to December 2012, 124 living liver donor candidates (M:F=80:44, age range 16-61 years) underwent MRE at 1.5T and MR fat quantification tools such as 3 point Dixon method and spectroscopy (MRS) at 3T. Among them, 115 patients underwent operations and the others did not for following reasons: deceased donor (n=3); revocation of donation (n=2); death of potential recipient (n=1); detection of other diseases during work-up (n=3). Sensitivity, specificity, positive predicted value (PPV) and negative predicted value (NPV) were obtained for detecting significant fibrosis (=F2) or significant hepatic steatosis (>10%). On MRE, cut-off values were set as 2.5kPa, according to the previous study of nonalcoholic steatohepatitis. On liver fat quantification map or MRS, cut-off values were 5% due to known underestimation of fat quantification on MR.

RESULTS
CONCLUSION
Combination of MR fat quantification and MRE is a good surveillance tool for determining necessity of LB in living donor candidates.

CLINICAL RELEVANCE/APPLICATION
Combined use of MR fat quantification and MRE could select liver biopsy cases among living donor candidates, and therefore, can reduce the necessity of biopsy which has potential of morbidity and mortality.

Gastrointestinal - Tuesday Posters and Exhibits (12:15pm - 12:45pm)

Tuesday, 12:15 PM - 12:45 PM  Lakeside Learning Center

LL-GIS-TUA  •  AMA PRA Category 1 Credit ™:0.5
Host
Alvin C Silva , MD

LL-GIE-TU10A  •  Primary Biliary Tract Malignancies: MRI Spectrum and Mimics with Histopathological Correlation
Sajeev R Ezapilli MBBS (Presenter) ;  Courtney A Coursey MD * ;  William C Small MD, PhD ;  Bobby T Kalb MD ;  Pardeep K Mittal MD

PURPOSE/AIM
◆ To demonstrate a spectrum of MRI and MRCP findings of primary biliary tract malignancies.
◆ To illustrate a variety of lesions which mimic primary malignant biliary tumors with histopathological correlation.

CONTENT ORGANIZATION
◆ Review the spectrum of primary malignant bile duct tumors with MRI, to characterize the lesion for location, morphology, soft tissue and fibrous composition, presence of scar and communication with the bile ducts.
◆ Illustrate MR findings of diverse intrahepatic and extrahepatic lesions which simulate primary malignant biliary tumors on MRI such as hepatocellular carcinoma, metastases, primary sclerosing cholangitis, IgG4 cholangiopathy and Mirizzi’s syndrome.
◆ Demonstrate histopathological correlations supplementing MRI findings, thus improving accuracy of diagnosis and preoperative intervention as well as treatment and followup.

SUMMARY
Appropriate and timely diagnosis with high accuracy is now possible in patients with primary biliary tumors using combination of MRI and MRCP. MRI imaging also assists in differentiation of neoplasic from non neoplasic biliary tract pathologies. MRI aids in identifying several entities which mimic primary biliary tract tumors thereby assisting clinicians in optimal management of these conditions.

LL-GIE-TU11A  •  Small Bowel Polyps in Peutz-Jeghers Disease: A Multimodality Approach
Philippe A Soyer MD, PhD (Presenter) ;  Christine C Hoeffel MD ;  Elliot K Fishman MD * ;  Valerie Laurent MD ;  Anthony Dohan MD ;  Elisa Amzallag-Bellenger MD ;  Xavier Dray MD ;  Mourad Boudiaf MD

PURPOSE/AIM
1. To describe the range of imaging features of small bowel polyps in Peutz-Jeghers disease (PJD) in adult patients. 2. To discuss and illustrate the capabilities of the various imaging modalities in the evaluation of adult patients with PJD. 3. To understand the advantages and limitations of the available imaging modalities compared with endoscopic techniques in this specific population. 4. To propose a practical and optimized approach to the use of imaging in adult patients with PJD.

CONTENT ORGANIZATION
1. PJD: histological, pathophysiological, clinical features. 2. Overview of imaging features of PJD (including MDCT-enteroclysis, virtual endoscopy, MR-enterography and MR-enteroclysis) with correlation with histopathological findings, push enteroscopy, spiral enteroscopy and video-capable endoscopic features. 3. Advantages and potential limitations of imaging techniques for a comprehensive evaluation of PJD at initial presentation and during small-bowel polyp surveillance.

SUMMARY
The major teaching points are: 1. Imaging has a predominant role in the evaluation of adult patients with PJD. 2. A multimodality approach is needed to overcome the intrinsic limitations of each modality in terms of polyp localization and size assessment. 3. Optimal evaluation of PJD is made using a combination of imaging and endoscopic techniques.

LL-GIE-TU12A  •  3D Imaging for Left Lobe Living Liver Donation to Adult Recipients: Predicting Operative Complexity
Saravanan K Krishnamoorthy MD (Presenter) ;  Irina Oyfe ;  Sachin Jambawalikar PhD ;  Morris Hayim MD ;  Cathleen Cooper ;  Martin R Prince MD, PhD * ;  Benjamin Samstein MBBS, MD

PURPOSE/AIM
Living left lobe liver donation is a life saving procedure in which the Radiologist plays a vital role. Preoperative imaging offers a wealth of information, including liver volumes and depiction of the hepatic anatomy. The imaging protocol must be optimized. Standardized reporting criteria, as specifics of the anatomy can warn the Transplant Surgeon about a potentially prolonged or complex hepatectomy. The exhibit will review (1) optimized imaging protocols, (2) various types of donation and methods of resecting the liver, (3) standardized reporting with an emphasis on variants that can prolong the surgery or increase the risk of a converting to an open surgery.

CONTENT ORGANIZATION
1. CT / MR Liver Donor Protocols
   • CTA, CT Cholangiogram: including optimization
   • MRA, MRCP: including Ablavar, Eovist, compressed SENSE, morphine

2. Donor Hepatectomy Procedures
· Laparoscopic, Lap Assisted, Open: including lap left lateral hepatectomy for adult recipients

3. Standardized Reporting
· Vascular anatomy that may preclude a laparoscopic left lobe donation, increase risk of conversion to an open surgery

SUMMARY
This exhibit with review how and why the Radiologist is a vital part of the multidisciplinary Liver Transplant Team. Imaging protocols for potential living donors, surgical techniques, and standardized reporting will be covered.

LL-GIS-TU1A • ShearWave Elastography Assessment of Liver Tumours Following Radiofrequency Ablation (RFA) and Irreversible Electroporation (IRE)

Wenshuo Tian (Presenter); Behzad Mokri-Moayvey; Xiaoyan Xie MD; Zuoefeng Xu MD, PhD; Mark Abel MBBS; Edward Leen MD, FRCA *

PURPOSE
SWE has been shown to be useful in monitoring response following RFA. IRE is a novel non-thermal technique of ablating tumours. Objective is to compare the elastography changes of liver tumours following radiofrequency ablation (RFA) and irreversible electroporation (IRE) ablation using ShearWave elastography (SWE).

METHOD AND MATERIALS
A total of 43 patients with liver tumours who had undergone RFA (n=26) and IRE (n=17) were studied using the Aixplorer scanner (Supersonic Imagine) with a SC6-1 transducer; SWE of the lesions were measured before, day-1 and day-14 after ablation. A mean value of 3 acquisitions was calculated following placement of the region of interest over the whole lesion and the ablation zone at their maximal diameter. Inter and intra-observer variability were also assessed in 19 subjects.

RESULTS
SWE was significantly higher at day-1 after RFA (34±14 kPa vs 70±17 kPa; P CONCLUSION
The impact of IRE ablation of liver tumours on SWE is significantly different from that of RFA and may also be used to monitor response. The changes following IRE ablation reflects the mechanism of cellular apoptosis. SWE is also reproducible.

CLINICAL RELEVANCE/APPLICATION
1) SWE may be used to assess response following both RFA as well as IRE at day-1 but RFA alone at day-14 2) SWE value is limited in evaluating IRE ablation response at day-14.

LL-GIS-TU2A • Diagnostic Accuracy of Iodine Tagging Computed Tomographic Colonography with Low-dose Bowel Preparation to Detect Colorectal Neoplasias in Patients with Positive Fecal Immunohistochemistry

Kenichi Utano MD (Presenter); Koichi Nagata MD; Tetsuro Honda MD; Takashi Kato MD; Michio Asano; Michiaki Hirayama MD; Hideharu Sugimoto MD

PURPOSE
This prospective multi-center study evaluates the diagnostic accuracy of computed tomographic colonography with low-dose bowel preparation in detecting colorectal neoplasias in a population at increased risk.

METHOD AND MATERIALS
We recruited 321 participants aged = 40 years with positive fecal immunochemical findings at seven institutions between December 2011 and September 2012. They were all assessed by computed tomographic colonography (CTC) with low-dose bowel preparation and optical colonoscopy on the same day. Low-dose bowel preparation comprised the consumption of polyethylene glycol (PEG; 400 mL), iodinated oral contrast agent (20 mL) and mosapride (20 mg) after breakfast and dinner on the day before CTC. Three experienced observers independently assessed all CTC images. Per patient sensitivity, specificity, and positive and negative predictive value were calculated as the reference standard colonoscopy by board-certified endoscopists.

RESULTS
Fourteen patients withdrew informed consent to participate and three others were excluded due to incomplete procedures. We thus evaluated 304 patients. No clinically significant complications developed during or after CTC. We identified 22 colorectal carcinomas in 20 patients. The sensitivity, specificity, positive and negative predictive values of CTC at a cut-off of = 10 mm (lesion size) were 0.93, 0.98, 0.91 and 0.99, respectively, and those at a cutoff of = 6 mm were 0.90, 0.93, 0.82 and 0.96, respectively, per patient.

CONCLUSION
Adenomas = 6 mm were accurately detected by CTC with low-dose bowel preparation.

CLINICAL RELEVANCE/APPLICATION
CTC with low dose bowel preparation could be an efficient triage technique for patients with positive findings of fecal occult blood due to its high negative predictive ability.

LL-GIS-TU3A • Abdominal CT: Is Dual-source, Dual-energy more Radiation Dose Efficient than Single-energy?

Matthias Benz (Presenter); Michele Pansini MD; Balazs Kovacs; Robert Bolt; Dorothee Harder; Georg M Bongartz MD *; Zsolt Szucs-Farkas MD, PhD; Sebastian T Schinda MD *

PURPOSE
To assess the image quality and low-contrast detectability of simulated liver lesions in abdominal CT using a dual-source, dual-energy and a single-energy technique at similar radiation dose in a phantom.

METHOD AND MATERIALS
A custom liver phantom with 43 hypodense tumors (diameters of 5, 10 and 15 mm; tumor-to-liver contrast of -10, -25, and -50 HU) was placed in a cylindrical water container that mimicked an intermediate-sized patient. The phantom was scanned with a dual-source CT scanner (Somatom Definition Flash, Siemens) using a single-energy protocol (120 kVp, 150 reference mAs) and a dual-energy protocol (tube A, 100 kVp, 190 reference mAs; tube B, 140 kVp, 162 reference mAs). Automatic tube current modulation was used for both CT protocols. The radiation dose was assessed with the volume CT dose index (CTDVol). The image noise was measured, and the contrast-to-noise ratio (CNR) of the tumors was calculated. Tumor detection was independently performed by three blinded radiologists. Statistical analysis included analysis of variance and non-parametric tests.

RESULTS
The CTDVol measured 14.9 mGy for the single-energy protocol and 14.6 mGy for the dual-energy protocol. The image noise was significantly lower in the dual-energy compared to the single-energy protocol (14.4 vs. 17.8 HU, respectively; P < 0.01). The CNR of the dual-energy protocol was significantly higher compared to the single-energy protocol (3.8 vs 3.1, respectively; P < 0.01). The overall sensitivity for tumor detection measured 74.4%, and 82.2% for the single-energy and dual-energy protocol, respectively (P = 0.45).

CONCLUSION
At similar radiation dose, abdominal dual-source, dual-energy CT demonstrates a significantly improved quantitative image quality and trend for improved low-contrast detectability compared to single-energy CT.
Liver Fat Content is Negatively Associated with Atherosclerotic Carotid Plaque in Type 2 Diabetic Patients

**Purpose**

Patients with gestational diabetes have a substantial increased risk of overt type II diabetes in comparison to the general population. Liver steatosis has been identified as an independent risk factor for the development of diabetes. H1-spectroscopy is an established method to measure liver fat content but is restricted to small voxel elements, long acquisition time and complicated post-processing. Fast modified Dixon sequences (mDixon) have been shown to be an alternative for liver fat assessment. The aim of this study was to compare mDixon with H1-spectroscopy for the quantitative assessment of liver fat content in patients with a history of gestational diabetes.

**Method and Materials**

Patients with a history of gestational diabetes within the last 6 months prior to imaging were included in this prospective study. All patients underwent both H1-spectroscopy (STEAM, TE 10ms, TR 2000ms, flip angle 90, voxel size 1.5x1.5x1.5cm³) placed in segment VII of the liver and mDixon imaging (TE first 1.5ms/second 2.7ms, TR 4.1ms, flip angle 10, at a 3 Tesla scanner. In the mDixon sequence a region of interest was placed in the same position as the voxel element in spectroscopy.

**Results**

A total of 54 consecutive patients (mean age 28.5±4.1 years, mean BMI 27±3.7) were included in the study. H1-spectroscopy (average acquisition time 8 minutes) and mDixon sequences (average acquisition time 30 seconds) were successfully performed in all patients. Average liver fat content was significantly higher in the mDixon sequences compared to H1-spectroscopy (5.1±4.5% vs. 2.4±5.7%, p≤0.001). This study demonstrated an excellent correlation between mDixon and H1-spectroscopy for measurements of liver fat content in patients with gestational diabetes. However, absolute values are higher with the mDixon sequence. Other fat compartments such as abdominal fat can also be assessed by mDixon within the same sequence.

**Conclusion**

Certain imaging features can be highly suggestive of the diagnosis of SPN, although it is not possible to predict aggressive histology on the basis of imaging findings, clinical presentation, or patient demographic features.

**Clinical Relevance/Application**

It is not possible to predict aggressive SPT histology on the basis of imaging findings, clinical presentation, or patient demographic features.

Liver Fat Content is Negatively Associated with Atherosclerotic Carotid Plaque in Type 2 Diabetic Patients

**Purpose**

Nonalcoholic fatty liver disease (NAFLD) is independently associated with atherosclerosis in nondiabetic individuals. In type 2 diabetic patients, the link between fatty liver and atherosclerosis is less clear. Here, we assessed whether liver fat content evaluated using 1H-magnetic resonance spectroscopy (1H-MRS) was independently associated with prevalent carotid plaque and as a marker of atherosclerosis in type 2 diabetic patients.

**Method and Materials**

144 prospectively enrolled patients with type 2 diabetes underwent liver fat content measurement using 1H-MRS and carotid plaque assessment using ultrasound. Multiple logistic regression was used to identify factors associated with carotid plaque.

**Results**

Mean ± SD liver fat content was 9.86 ± 8.12%. Carotid plaque prevalence was 52.1% (75/144). Patients without plaque were younger (P=0.006) and had a smaller visceral fat area (P=0.015), lower reported prevalence of previous cardiovascular events or current statin therapy (P=0.002), and higher liver fat content than those with plaque (P=0.009). By multivariable logistic regression, increased liver fat content independently predicted the absence of carotid plaque (Odds Ratio, 0.94; 95% confidence interval, 0.89-0.99; P=0.017).

**Conclusion**

Liver fat content measured by 1H-MRS is higher in type 2 diabetic patients without carotid plaque compared to those with plaque. This study suggests that increased liver fat content could be associated with a relative protection against carotid atherosclerosis in patients with type 2 diabetes mellitus. Longitudinal studies are necessary to determine whether liver fat content in type 2 diabetic patients is associated with long-term cardiovascular morbidity and mortality.

**Clinical Relevance/Application**

Abdominal dual-source, dual-energy CT improves radiation dose efficiency compared to single-energy CT.
Liver fat content evaluated using 1H-magnetic resonance spectroscopy (1H-MRS) is independently associated with prevalent carotid plaque as a marker of atherosclerosis in type 2 diabetic patients.

**LL-GIS-TU7A** • Role of Preoperative Imaging with Multidetector Computed Tomography in the Management of Patients with Gastroesophageal Reflux Disease Symptoms after Laparoscopic Sleeve Gastrectomy

Marco Rengo MD (Presenter); Damiano Caruso MD; Davide Bellini MD; Carlo Nicola De Cecco MD; Paola Lucchesi; Andrea Laghi MD *

**PURPOSE**
To evaluate if multidetector computed tomography (MDCT) can be helpful and useful in the decision-making process in sleeve patients with gastroesophageal reflux disease (GERD) symptoms and to demonstrate the reproducibility and accuracy of the technique.

**METHOD AND MATERIALS**
Twenty-three patients submitted to laparoscopic sleeve gastrectomy (LSG), complaining upper GI symptoms and/or weight regain and candidates to laparoscopic surgical revision were investigated. All patients underwent upper GI barium study, endoscopy and multidetector computed tomography (MDCT) for the identification of esophageal dilatation, neofundus development, thoracic sleeve migration, sleeve dilatation and/or antrum dilatation. Selected patients underwent laparoscopic sleeve revision, curoplasty and/or fundectomy according to MDCT findings. Surgical findings were considered as "gold standard". Symptoms persistence or resolution was investigated after 6 months with a standard clinical questionnaire.

**RESULTS**
A total of 21 patients with sleeve migration or dilatation and neofundus underwent laparoscopic revision. A strong correlation between MDCT preoperative findings and intraoperative findings was observed. The presence of sleeve migration was significantly underestimated by both conventional radiology and upper GI endoscopy (sensitivity of 57.1% and 50% respectively). Symptoms remission was observed in 19 out of 21 patients at 6 months. In two cases surgical revision was not indicated on the basis of MDCT findings.

**CONCLUSION**
MDCT is more accurate the conventional radiology and endoscopy for the detection of morphological alteration causing GERD symptoms after LSG and can be considered a valid non-invasive method to guide surgery and monitoring patients following revision.

**CLINICAL RELEVANCE/APPLICATION**
MDCT is an accurate non-invasive method for the identification of GERD related complications after LSG.

**LL-GIE-TU8A** • The Role of Intra-Operative Ultrasound in Oncologic Therapy

Tara L Sagebiel MD (Presenter); Leonardo P Marcal MD; Tharakeswara Kumar Bathala MD; Catherine E Devine MD; Priya R Bhosale MD; Deepak G Bedi MBCh *

**PURPOSE/AIM**
- Educate the viewer on the diverse roles of intra-operative ultrasound (IOUS) in oncologic surgical treatment
- Review the indications, relevant anatomy, ultrasound equipment and scanning protocol for each procedure
- Discuss common technical issues and solutions

**CONTENT ORGANIZATION**
- **Indications for IOUS**
  1. Tumor localization and mapping
  2. Characterization of indeterminate lesions
  3. Survey for multifocal disease
  4. Guidance of therapy instruments
- **Cases performed at our institution**
  1. Liver for metastatic lesion localization
  2. Adrenal for optimal lesion resection
  3. Kidney for nephron-sparing partial nephrectomy
  4. Pancreas for multifocal tumor localization
  5. Tandem and ovoid placement
  6. Soft tissue tumor localization and mapping (sarcoma, melanoma)
  7. Lymph node localization
  8. Incision placement for optimal gastrostomy tube incision
- **Procedure guidelines**
  1. Relevant anatomy
  2. Pre-operative review of other imaging findings
  3. Optimal transducer
  4. What to convey to surgeon
- **Examples of pathology**
- **Common problems and solutions**

**SUMMARY**
IOUS has a wide range of applications in oncologic treatment, including incision guidance, lesion localization, survey for multifocal disease and lesion characterization. This exhibit reviews the techniques and relevant anatomy and pathology for each procedure.

**LL-GIE-TU9A** • Post Neoadjuvant Chemoradiotherapy Rectal MRI for Restaging Rectal Cancers: A Pictorial Review

Dee Nandurkar FRANZC; Gerrard Smith MBBS, FRANZCR; Bimal Kumar Parmeswaran MBBS, FRANZCR; Robin Cassumbhoy MBBS, FRANZCR; Eddie W Lau FRANZC (Presenter)

**PURPOSE/AIM**
To present a comprehensive pictorial review of the MRI appearance of rectal cancers following neoadjuvant chemoradiotherapy.

**CONTENT ORGANIZATION**
The pictorial review presents a background of rectal cancer treatment with particular reference to the use of neoadjuvant chemoradiotherapy (CRT). Neoadjuvant chemoradiation is the standard of care in an appropriately selected cohort of patients with rectal cancers as it reduces the risk of local recurrence, improves survival by downstaging tumour and increases the chance of sphincter preservation. MRI assessment of tumor regression after CRT is now an established imaging practice. This pictorial review will provide the reader with a comprehensive review of the varying imaging appearance of rectal cancers after CRT and enable the reader to accurately grade tumor regression.

**SUMMARY**
The post CRT MRI assessment of tumour regression grade correlates well with disease free and overall survival. Post CRT MRI prediction of the CRM involvement is also predictive of the risk of local recurrence. Post CRT MRI is able to differentiate the good from the poor responders. As phase II trials are evaluating the option of surgical deferral in the good responders, radiologists should be well versed with the MR appearance of rectal cancers post CRT and be able to accurately grade tumor regression.
LL-GIE-TU10B • Ultrasound-guided Percutaneous Core Biopsy of Pancreatic Tumor: Tips and Tricks to Ensure Safe and Effective Biopsy

Suk Hee Heo MD (Presenter); Jin Woong Kim MD; Sang Soo Shin MD; Sung Mo Kim; Yong-Yeon Jeong MD; Heoung-Keun Kang MD

PURPOSE/AIM
To review the ultrasound-guided percutaneous core biopsy (USPCB) of pancreatic tumor including indications, approach routes, tips of needle handling, contraindications, and potential complications, with emphasis on how to decide safe needle pathway using video clips and illustrations.

CONTENT ORGANIZATION
A. General overview of USPCB
1. Indications
2. Contraindications
3. Patient preparation before biopsy
B. How to decide approach route according to the location of pancreatic tumors: explanation with various clinical cases using video clips and illustrations
1. Proper planning of percutaneous needle approach route
a. Transomental approach
b. Transgastric approach
c. Transenteric approach
d. Transhepatic approach
e. Transsplenic approach
f. Transrenal approach
2. Technical tips and tricks for safe and effective USPCB
a. How to effectively handle a biopsy needle under the ultrasound
b. What to know in order to avoid potential complications
C. Summary

SUMMARY
USPCB of pancreatic tumor cannot be easily performed and usually requires experienced radiologists. However, it could be a safe and feasible method with a full understanding of the proper methodology. We will review the USPCB with various cases using video clips and illustrations about proper approach route and technical tips to ensure safe biopsy.

LL-GIE-TU11B • Complications of Radiofrequency Ablation for Liver Tumors: An Update on Management and Long-term Outcomes

Jihye Min MD (Presenter); Hyo Keun Lim MD; Min Woo Lee; Young-Sun Kim; Dongil Choi; Hyunchul Rhim MD, PhD

PURPOSE/AIM
The aim of the this exhibit is
1. To describe the imaging features and managements of various complications associated with radiofrequency ablation (RFA)
2. To review the risk factors potentially affecting RFA-induced complications
3. To determine the impact of RFA-induced complications on the long term outcomes of RFA.

CONTENT ORGANIZATION
Although RFA is considered to be a safe and effective technique for treating liver tumors, various complications can happen when inadequately performed. We have performed more than 6,000 RFA procedures for treating liver tumors during the recent 14 years period and encountered diverse procedure-related complications.
We divided RFA-induced complications into five types: hemorrhage, hepatic vascular injuries, biliary injuries, extrahepatic organ injuries and tumor progression.

SUMMARY
The major teaching points of this exhibit are
1. Because an early and accurate diagnosis of complications is mandatory for proper management, radiologists should be familiar with the imaging features, as well as management strategies of RFA-induced complication.
2. Through understanding of risk factors for developing RFA-induced complications may be beneficial in preventing potential complications.
3. Physicians who perform RFA should be aware of the impact of RFA-induced complications on the long term therapeutic outcomes of RFA.

LL-GIE1241-TUB • Rapid kVp-Switching Single-Source Dual-Energy CT: Practical Technology and Techniques

Lincoln L Berland MD (Presenter)*; David N Bolus MD; Mark E Lockhart MD; Desiree E Morgan MD*; John V Thomas MD, MRCP; Therese M Weber MD; Michael V Yester PhD

PURPOSE/AIM
Dual energy CT technology remains confusing, and the two current commercial versions differ substantially. This exhibit will be a practical guide for radiologists to the principles of single source rapid kVp-switching dual energy CT (RSDE) and its current and prospective clinical applications.

CONTENT ORGANIZATION
Principles of technology and techniques will be illustrated, including how rapid kVp-switching, using projection space, leads to two types of image series: 40-140 keV simulated image series (101 keV versions of the same image series) and material decomposition basis-pair image series. Basis pairs may be constructed from a variety of pair choices, the most common being water-iodine. The value and limitations of mg/cc material content analysis will be discussed. Analysis tools will be described, including scatterplots, spectral curves, color filters and contrast-to-noise curves. The use of these tools will be illustrated with several clinical applications, such as renal and post-ablation liver masses, renal calculi, pancreatic and adrenal masses and metal artifact reduction techniques.

SUMMARY
Rapid kVp-switching dual energy CT may be optimized after achieving familiarity with the basic principles of technology and the tools for clinical analysis. This exhibit will establish the basis for radiologists to use RSDE in daily practice.

LL-GIE-TU12B • Hypervascular Liver Lesions Revisited: MR Imaging Characteristics and Differentiating Features from Hepatocellular Carcinoma

Anne Gill MD (Presenter); Courtney A Coursey MD*; Burcu Saka MD; Volkan Adsay; Pardeep K Mittal MD

PURPOSE/AIM
To review the MR appearance of more common hypervascular liver lesions: hemangioma, focal nodular hyperplasia, arterio-portal shunt, transient hepatic intensity difference (THID), hepatocellular carcinoma (HCC), hypervascular metastases, adenoma, hepatic arteriovenous malformation, and nodular regenerative hyperplasia.

To review the MR appearance of less common hypervascular liver lesions: fibrolamellar HCC, SVC obstruction, Peliiosis Hepatis, and hepatic angiosarcoma.

To correlate the MR imaging appearance of hypervascular liver lesions with histopathology specimens.

**CONTENT ORGANIZATION**
- Review the current MR imaging technique and contrast protocols for focal hepatic lesions.
- Discussion of the differential diagnosis of hypervascular liver lesions and the appearance on various MRI sequences.
- Review the histopathologic features of each lesion and correlate the histopathology with the imaging appearance.

**SUMMARY**
Hypervascular liver lesions encompass a wide variety of diagnoses and a spectrum of imaging features on MRI. Recognition and accurate diagnoses of these lesions is of utmost importance for radiologists. Correlation of imaging findings with histopathology helps clarify and explain the lesions' appearance on various MR sequences.

**LL-GIE-TU7B • Diffusion Imaging of Pancreatic Disease: Pearls Every Resident Must Know**
Rammohan Vadapalli MD (Presenter); Abhijit Roychowdhury MD; Abhinav Sriman S Vadapalli; Krishna Mohan Pottal MD; Manoj Ranjan MD; Raghavendra Itgampalli; Jagath S Weerakkody Dipi Phys, DMD

**PURPOSE/AIM**
- Review the technique, protocol, and parameters for DWI protocol in the evaluation of pancreatic disease.
- Describe the clinical problem solving features of Diffusion MR imaging in pancreatic disease: like acute vs chronic pancreatitis, Pancreatic pseudocysts, Pancreatic Adenocarcinoma, Pancreatic Cyst adenomas (serous versus mucinous), Neuroendocrine tumors, Solid papillary epithelial neoplasms.

**CONTENT ORGANIZATION**
Content organization:
1. Concepts with take home teaching points in using High Value DWI in Pancreatic Imaging for disease characterization, an adjunct tool in addition to other morphological features.
2. Overview of DWI features and ADC profile of Common and Uncommon Pancreatic diseases including inflammation, Pseudocyst, Fibrosis and neoplasms.
3. DWI features of an occult intra pancreatic non contour deforming Pancreatic adenocarcinoma with Clinical examples.

**SUMMARY**
This exhibit elucidates the role of DWI in pancreatic diseases and gives comprehensive understanding of its value in detection of an early intra pancreatic occult neoplasm (adenocarcinoma). Also characterization of pancreatic disease by signal attenuation of the tissues in images obtained at different B values as well as the quantitative ADC profile of the tissues of interest.

**LL-GIE-TU8B • Laparoscopic Abdominal Gastric Banding: Expected Imaging Findings and Complications on Radiographs, Fluoroscopy and Computed Tomography**
Juliana Rosenblat MD (Presenter); Artemis Petrides MD; Douglas S Katz MD; Collin Brathwaite; Barak Friedman MD; John Hines MD

**PURPOSE/AIM**
- Review indications for and surgical technique involved in gastric banding.
- Review normal postoperative appearance on imaging of patients who have undergone laparoscopic gastric banding.
- Review complications of laparoscopic gastric banding and their corresponding imaging findings.

**CONTENT ORGANIZATION**
- Description of procedure, mechanism of weight loss.
- Indications
- Normal post-operative appearance
- Short and long term complications and their imaging findings.

**SUMMARY**
Laparoscopic adjustable gastric banding is a type of bariatric surgery whose efficacy stems from restricting caloric intake by placing a tight, adjustable prosthetic band around the stomach. The band is placed immediately inferior to the gastroesophageal junction, by creating a retrogastric tunnel from the lesser curvature of the stomach to the angle of His. The band will thus lie in the 1-3 o'clock position in most patients, which is clearly demonstrated on radiographs and fluoroscopy. However, there are both short and long term complications that can occur. Short term complications include stomal obstruction, band infection, gastric perforation, hemorrhage, or delayed gastric emptying. Late complications include band erosion, band slippage or prolapse, port malfunction, leakage at the port site tubing or band, pouch or esophageal dilatation, and esophagitis.

**LL-GIE-TU9B • Many Faces of Abdominal Ischemia: Spectrum of CT Findings**
Zina J Ricci MD; Bindu Kaul MBBS; Sarah K Oh MD; Victoria Chernyak MD *; Marjorie W Stein MD; Fernanda S Mazzariol MD (Presenter); Milana Flusberg MD; Alla M Rozenblit MD

**PURPOSE/AIM**
Ischemia is a common cause of acute abdominal pain. Our objective is to review the CT imaging features of arterial and venous ischemia in various abdominal organ systems to aid in confident diagnosis and help guide appropriate management. Correlation with MRI and ultrasound will be provided in selected cases.

**CONTENT ORGANIZATION**

**SUMMARY**
- Teaching Points: 1. Review CT appearances of ischemia and infarction in various abdominal organ systems. 2. Highlight imaging pearls to allow for confident diagnosis. 3. Differentiate ischemia from mimicking conditions. SUMMARY: After this review, the radiologist will be able to confidently diagnose abdominal ischemia on CT scan and facilitate prompt and effective treatment.

**LL-GIS-TU1B • Preoperative Prediction Factors for Conversion of Laparoscopic to Open Cholecystectomy**
Dae K Na (Presenter); Heon-Ju Kwon MD; Mi Sung Kim MD; Hae Won Park MD

**PURPOSE**
To determine preoperative prediction factors of CT findings in patients underwent conversion from laparoscopic to open cholecystectomy for benign gallbladder disease.

**METHOD AND MATERIALS**
This retrospective study was approved by our institutional review board, and informed consent was waived. We included 908 patients underwent laparoscopic cholecystectomy from January 2010 to January 2012. In consensus, two radiologists retrospectively evaluated
RESULTS
Conversion to open cholecystectomy was performed in 47 (5.1%) of 908 patients. In univariate analysis, anatomic variation of gallbladder (Odds Ratio [OR], 22.6; 95% confidence intervals [CI], 2.3 to 222.8), mucosal disruption of gallbladder (OR, 9.4; 95% CI, 4.4 to 20.1), perforation of gallbladder (OR, 29.5; 95% CI, 1.2 to 25.9), pericholecystic fluid or abscess (OR, 22.7; 95% CI, 6.7 to 76.7), pericholecystic hepatic parenchymal hyperemia (OR, 3.3; 95% CI, 1.7 to 6.6), severe atherosclerosis (OR, 14.4; 95% CI, 5.6 to 36.8) and stone in the cystic duct (OR, 15.8; 95% CI, 2.6 to 95.8) were able to predict for conversion. In multivariate analysis, anatomic variation of gallbladder (adjusted OR, 66.1; 95% CI, 1.5 to 2908.9) and pericholecystic fluid or abscess (OR, 11.5; 95% CI, 2.9 to 46.1) were defined as independent prediction factors.

CONCLUSION
On preoperative CT images, anatomic variation of gallbladder and pericholecystic fluid/abscess are associated with conversion from laparoscopic to open cholecystectomy. Recognition for these predictive factors for conversion could improve preoperative patient counseling and establish proper surgical planning.

CLINICAL RELEVANCE/APPLICATION
Recognition for predictive factors for conversion on preoperative CT images could improve preoperative patient counseling and establish proper surgical planning.

LL-GIS-TU2B  •  Optimization of Acquisition Interval in Abdominal CT Perfusion Measurement

Tomonori Kanda; Takeshi Yoshikawa MD (Presenter) *; Keitaro Sofue; Yoshiharu Ohno MD, PhD *; Yasuko Fujisawa MS *; Hisanobu Koyama MD; Mizuho Nishio MD *; Noriyuki Negi RT; Tohru Murakami; Naoki Kanata MD; Kazuro Sugimura MD, PhD *

PURPOSE
To optimize acquisition interval in upper abdominal CT perfusion measurement

METHOD AND MATERIALS
Seventy seven patients (male: 46; female: 21; mean: 67.5 years) underwent upper abdominal CT perfusion (CTP). Scans were conducted from 7 to 120 seconds after administration of contrast medium and 25 ml saline chaser. The patients were randomly divided into two groups; group 1 (data set A, every 2 seconds during the first 30 seconds, total 22 scans) and 2 (B, every 3 seconds, 17 scans). Third set was made from group 1 data (C, every 4 seconds, 13 scans). Demographic features of the groups and CTDIvol (mGy) and DLP (mGy.cm) were recorded. Hepatic arterial and portal perfusion (HAP and HP, ml/min/100 ml), arterial perfusion fraction (APF, %), mean transit time (MTT, sec), and distribution volume (DV, ml/100 ml) were calculated using dual-input maximum slope (dMS), deconvolution (dDC), and compartment model (dCM) methods using the same ROIs on a prototype software. Arterial perfusions (AP), MTTs, and DVs in the pancreas, spleen, and gastric wall were calculated using single-input MS, DC, and CM (sMS, sDC, sCM) methods. The values were compared between the groups and between data sets A and C.

RESULTS
There was no significant difference in demographic features. CTDIvol (70.3 and 54.4, p

CONCLUSION
Although longer acquisition interval protocol has the benefit of lower radiation dose, equal to or less than every 3-second interval is recommended in upper abdominal CT perfusion.

CLINICAL RELEVANCE/APPLICATION
Although longer acquisition interval protocol enjoys the benefit of lower radiation dose, equal to or less than every 3-second interval is recommended in upper abdominal CT perfusion.

LL-GIS-TU3B  •  Preoperative N Staging of Early Gastric Cancer: Gross and Microscopic Determinants of Multidetector Computed Tomography Findings in pN0 Patients

Jung-Hyun Kang (Presenter); Jeong-Sik Yu MD; Jae-Joon Chung MD; Joo Hee Kim; Eun-Suk Cho; Ki Whang Kim MD

PURPOSE
To identify determinants of lymph node manifestations on preoperative multidetector computed tomography (MDCT) in early gastric cancer patients with pN0 disease.

METHOD AND MATERIALS
For 199 patients with early gastric cancer in the pT1pN0 category, the largest perigastric lymph node on preoperative MDCT in each patient was categorized based on cutoffs for eight different parameters (short and long diameter 4 mm, 6 mm, or 8 mm; mean attenuation 100 HU; short-to-long diameter ratio 0.7) and correlated with the size, gross type, depth of invasion, and microscopic type of the primary lesions by chi-square test and multiple logistic regression analysis.

RESULTS
When the primary lesion was larger than 3 cm, the lymph nodes were larger for four parameters (short diameter or long diameter, 4 mm or 6 mm; p

CONCLUSION
Benign regional lymph node enlargement is more frequent in early gastric cancer patients with a primary lesion of larger size or poor microscopic differentiation, and less frequent in patients with gross type IIb disease.

CLINICAL RELEVANCE/APPLICATION
We hope that increased knowledge of factors that induce benign perigastric lymph node enlargement in early gastric cancer will lead to more accurate staging of lymph nodes in pre-operative CT scans.

LL-GIS-TU4B  •  Diffusion-weighted MR Imaging: Usefulness for Differentiating Intrapancreatic Accessory Spleen and Small Hypervascular Neuroendocrine Tumor of the Pancreas

Nieun Seo MD (Presenter); Jin Hee Kim MD; Bo-Kyeong Kang MD; Jae Ho Byun MD; Seung Soo Lee MD; Hyoung Jung Kim MD; So Yeon Kim MD

PURPOSE
To investigate the usefulness of diffusion-weighted MR imaging (DWI) and measurement of apparent diffusion coefficient (ADC) value for differentiating intrapancreatic accessory spleen (IPAS) from small hypervascular neuroendocrine tumor (NET) of the pancreas.

METHOD AND MATERIALS
Twenty-five patients with IPAS, diagnosed by surgery (n=3), biopsy (n=2), scintigraphy (n=1), or typical imaging features (n=19) and 31 patients with small (=3cm) hypervascular NET of the pancreas, diagnosed by surgery (n=28) or biopsy (n=3) underwent both contrast-enhanced MRI (CE-MRI) and DWI. A hypervascular NET was defined as a lesion that appeared hyperintense to the normal pancreatic parenchyma in the arterial phase of CE-MRI. The visually assessed signal intensity of the pancreatic lesions compared with the spleen on DWI (b-value of 1000 sec/mm2) and ADC values were compared between IPAS and NET group. For 25 IPASs and 13 NETs in the pancreatic tail, two blinded radiologists independently reviewed two MR image sets (CE-MRI alone vs. combined CE-MRI and DWI) and...
rated their confidence in differentiating between the two conditions using a five-point scale for each image set. The diagnostic performances of two MR image sets were compared using ROC analysis and McNemar test.

RESULTS
The isointensity of the pancreatic lesions compared with the spleen on DWI was more frequently observed in IPAS than in NET (92% vs. 12.9%, p=3x10^{-3} \text{mm}^2/\text{sec} vs. 1.44 \times 10^{-3} \text{mm}^2/\text{sec} as the cut-off value, were 96% and 93.5%, respectively. For both readers, the area under the ROC curve and accuracy in differentiating the two conditions, of combined CE-MRI and DWI were significantly greater than those of CE-MRI alone (P=.039).

CONCLUSION
Visual assessment of DWI and ADC quantification were useful in differentiating IPAS from small hypervascular NET of the pancreas. The diagnostic performance of combined CE-MRI and DWI was superior to that of CE-MRI alone for differentiating the two conditions.

CLINICAL RELEVANCE/APPLICATION
The use of DWI in combination with conventional CE-MRI may help to minimize unnecessary invasive procedures in patients with IPAS and to avoid misdiagnosing patients with NET as having IPAS.

**LL-GIS-TU5B • The Value of Spectral HU Curve in Evaluating Histodifferentiation of Gastric Cancer: A Pilot Study**

Lihong Chen (Presenter) ; Qing Duan ; Yunjing Xue MD

PURPOSE
To assess the clinical application of gemstone spectral CT imaging in evaluating the different differentiation-state of gastric cancers quantitatively based on the basis of spectral HU curve

METHOD AND MATERIALS

RESULTS
There were 32 moderate differentiated and 35 poor differentiated adenocarcinoma confirmed pathologically in our research(well differentiated adenocarcinoma was exclude for only 2 cases).The absolute mean slope rates of moderate differentiated adenocarcinoma were lower than those of poor differentiated adenocarcinoma, they were 1.11±0.39 vs 1.20±0.62 in AP; and 1.67±0.41 vs2.14±0.54 in VP and 1.57±0.46 vs2.0±0.53 in PP, respectively. There were significant difference of mean slope rates between moderate differentiated and poor differentiated adenocarcinoma (all of them P<0.05). Meanwhile monochromatic CT values measured on every single energy level of moderate differentiated adenocarcinoma were lower than those of poor differentiated adenocarcinoma,. Significant difference (all of them P<0.05) was found in AP.

CONCLUSION
The spectral HU curve could be used to differentiate moderate differentiated adenocarcinoma from poor differentiated adenocarcinoma and was helpful to evaluate the differentiation-state of gastric cancers.

CLINICAL RELEVANCE/APPLICATION
Differential diagnosis of differentiation degree for gastric carcinoma is important for survival prognosis and helpful for framing treatment scheme.

**LL-GIS-TU6B • Measuring Liver Fat Content after Alcohol Intoxication Using Dual Energy CT (DECT) in a Rat Animal Model**

Wolfgang Kromen (Presenter) ; Huedayi Korkusuz MD ; Bahram Raschidi ; Thomas J Vogl MD, PhD

PURPOSE
Quantitative evaluation of liver fat content provoked by alcohol intoxication using dual energy CT (DECT) determined attenuation in correlation to the biochemically measured liver fat content in a rat model.

METHOD AND MATERIALS

RESULTS
Dual energy CT (DECT) allows for an excellent biochemically proven non-invasive quantification of liver fat content in a rat model of an alcohol intoxication induced fatty liver.

CLINICAL RELEVANCE/APPLICATION
Dual energy CT is an excellent tool for quantifying the liver fat content. This might i.e. play an important role in predicting the quality of the (fatty) donor organ in split liver transplantations.

**BOOST: Gastrointestinal-Case-based Review (An Interactive Session)**

Tuesday, 03:00 PM - 04:15 PM • S103AB

**Gastrointestinal (Dual Energy CT Imaging)**

Tuesday, 03:00 PM - 04:00 PM • E353A
Detection of Hepatocellular Carcinoma with Rapid Switching Dual Energy Spectral MDCT (DECT)

Rupan Sanyal MD (Presenter) *; John V Thomas MD, MRCP; Lauren F Alexander MD; Mark D Little MD; David N Bolus MD; Desiree E Morgan MD *

**PURPOSE**
Evaluate increased conspicuity of hyperenhancing hepatocellular carcinoma (HCC) using lower viewing keV and iodine material decomposition images.

**METHOD AND MATERIALS**
IRB approved/HIPAA compliant retrospective study of consecutive cirrhotic outpatients with HCC evaluated with rapidly switching DECT at outpatient facility of tertiary care where 120 liver transplants are performed each year. Variables evaluated on independent dual energy workstation included: iodine concentrations (x100 mcg/cc), Hounsfield units (HU) at 70 and 52 keV, and image noise; absolute contrast difference between tumoral and nontumoral liver (abHU), iodine difference, and conspicuity (abHU or iodine difference/image noise) were calculated and compared using t test and ANOVA.

**RESULTS**
47 subjects (18 females) had 86 tumors, median size 2.2 cm. Mean tumor HU at 52keV was statistically different than at 70 keV (99.0 HU and 161.3 HU, respectively, p < 0.05). HCC conspicuity is best on iodine material decomposition images. HCCs are better visualized at lower viewing energy using rapid switching DECT compared to routine 70 keV images simulating routine PACS viewing.

**CONCLUSION**
Iodine material decomposition images and lower viewing energies are recommended for enhanced detection hyperenhancing hepatocellular carcinoma using rapid switching dual energy MDCT.

Quantitative Correlation between Liver Fat and Biopsy Score Using Multi-material Decomposition and Fast-kV Switching Dual-energy CT

Masayuki Kudo PhD, RT (Presenter) *; Tomoko Hyodo MD; Takamichi Murakami MD, PhD *; Peter Lamb *; Paulo R Mendonca PhD *; Masanobu Uemura

**PURPOSE**
The purpose of this study was to investigate the correlation between liver fat volume percentage (LFV%), obtained using a method based on multi-material decomposition (MMD) and histopathologic biopsy score in patients with nonalcoholic fatty liver disease (NAFLD) and alcoholic steatohepatitis.

**METHOD AND MATERIALS**
This study included 31 patients who underwent non-contrast (NC) and contrast-enhanced (CE) CT of the upper abdomen with dual energy CT (DECT) within 4 weeks prior to liver biopsy. The scan parameters employed for this study were 80/140kVp, 630mA, 0.6 sec/rot, 5mmTH, and helical mode. For CE studies, a non-ionic contrast agent was used and imaging was performed at the arterial, portal venous, and equilibrium phases. LFV% maps were generated from DECT data using MMD. For NC and CE exams, the measured LFV% was the average of 3 regions-of-interest (ROIs) that were placed in the hepatic parenchyma of the LFV% maps corresponding to the planned biopsy site. LFV% measurements were correlated with histopathologic grade of steatosis by the NAFLD activity (NAS) score. Differences in the mean LFV% for NC and CE data were tested by two-factor analysis of variance (ANOVA) with post hoc Tukey-Kramer test. Spearman rank correlations were calculated between NC LFV% and NAS steatosis score.

**RESULTS**
NAS steatosis scores were 0 in 4 patients, 1 in 15 patients, 2 in 12 patients and 3 in 0 patients. The mean LFV% of each NAS steatosis score group was 1.2%, 6.0% and 15.2%, respectively. Two-factor ANOVA results showed a statistically significant difference in LFV% by NAS score (p < 0.05). MMD-based LFV%, from both NC-CT and CE-CT data, shows statistically significant correlation to histopathologic biopsy grade, implying MMD can be used to accurately LFV% in the liver. Due to the agreement between LFV% across all phases of imaging (NC and CE), MMD can potentially obviate the need for the NC acquisition in DECT imaging of patients with fatty liver disease, which can lead to a significant reduction of radiation dose to patients.

**CLINICAL RELEVANCE/APPLICATION**
MMD-based method of LFV% using fast-kV switching DECT enables accurate, non-invasive, and rapid measurement of LFV%. MMD may reduce total radiation dose by obviating the need for a NC-CT acquisition.

Spectral CT Imaging in Differential Diagnosis of Pancreatic Ductal Adenocarcinoma and Mass Forming Pancreatitis

Xiao Zhu Lin MD (Presenter); Su Zhang; Chao Li; Xueqin Xu; Kemin Chen MD, PhD; Fuhua Yan

**PURPOSE**
The objective of this study is to investigate the spectral CT imaging features of pancreatic ductal adenocarcinoma (PDAC) and mass forming pancreatitis (MFP) and to assess its value in differential diagnosis between them.

**METHOD AND MATERIALS**

**RESULTS**

**CONCLUSION**
The PDAC and MFP had different characteristic on spectral CT imaging. CT value on 70keV in late arterial phase was the best parameter for the differential diagnosis between PDAC and MFP.

**CLINICAL RELEVANCE/APPLICATION**
Spectral CT imaging with multiple parameters is a new technique for differential diagnosis between PDAC and MFP, which has a potential to improve the diagnosis accuracy.

Detection of Stones and Calcifications in the Hepatobiliary System on Virtual Nonenhanced Dual-energy CT

Da-Ming Zhang MD (Presenter); Xuan Wang MD; Huadan Xue MD; Hao Sun MD; Yu Chen MD; Zhengyu Jin MD

**PURPOSE**
To retrospectively determine the features of stones and calcifications in hepatobiliary system after virtual elimination of contrast medium at dual-energy computed tomography (CT).

**METHOD AND MATERIALS**
The institutional ethics committee approved this retrospective study with waiver of informed consent. A total of 128 stones (gallbladder, bile duct ) and calcifications of liver found in 110 patients were examined with single-energy nonenhanced CT and dual-source dual-energy CT in the portal venous phase (100kVp and 140 kVp). Virtual nonenhanced (VNE) images were generated from the portal venous phase dual-energy CT data sets by using commercially available software (Syngo, Dual Energy Liver VNC; Siemens Healthcare). The CT numbers for the stone, liver, and bile; stone size; and image noise were assessed for each image set. The conspicuity and size of...
the stones, image quality of the VNE images as a replacement for true nonenhanced (TNE) images were assessed.

RESULTS

CONCLUSION
After virtual elimination of contrast medium, the CT value and CNR of the lesions decreased, the size stayed the same. The lesions which attenuation greater than 229.2HU and size larger than 0.15 cm² can be detected with good reliability.

CLINICAL RELEVANCE/APPLICATION
The derived monochromatic images from DEsCT could improve the accuracy of T and N staging in rectal cancer. nIC and dnIC values between metastatic and non-metastatic lymph nodes in AP and the changes between AP and PP (dnIC) were also significantly different (P=0.02, P=0.01).

CONCLUSION
The slope of DECT keV spectrum had the potential to differentiate HCC/hemangioma, metastasis and cyst.

CLINICAL RELEVANCE/APPLICATION
Dual-source DECT may provide additional information for the differential diagnosis of liver lesions without interrupting CT scanning workflow or adding radiation dose.

SSJ08-06 • Differentiating Liver Lesion Types by DECT keV Spectrum

Xiaohui Qi MD ; Gaofeng Shi MD ; Qi Wang BSc (Presenter) ; Runze Wu

PURPOSE
To investigate the possibility of using dual-energy CT keV spectrum to differentiate hepatic carcinoma (HCC), liver metastasis, hemangioma and cysts.

METHOD AND MATERIALS
Eighty-one patients with liver diseases were enrolled. The dual-energy CT was performed at the portal venous phase with tube voltage 100kVp/140 kVp, tube current 230/178 mAs, collimation 32 × 0.6 mm, slice thickness 5 mm, reconstruction interval 5 mm. After the injection 90 ml contrast agent at flow rate of 3 ml/s, arterial and venous phase images were acquired at 30 and 70 s delay. The venous phase keV images were calculated on a commercial workstation using the images of high and low kVp. The region of interest was carefully placed on the lesions to measure the CT value for 40–110 keV. The surrogate slope of keV spectrum was calculated by difference of CT value at 40 and 110 keV divided by 70. After grouped by lesion types, the slopes were compared between HCC, metastatic lesion, hemangioma and cyst.

RESULTS

CONCLUSION
The derived monochromatic images from DEsCT could improve the accuracy of T and N staging in rectal cancer. nIC and dnIC values may help to differentiate between primary rectal cancer with different histological grading, and between metastatic and non-metastatic lymph nodes.

CLINICAL RELEVANCE/APPLICATION
(dealing with dual energy spectral CT) ‘DEsCT can improve the accuracy of TN staging and differentiate histological grading of rectal cancer and is recommended in the rectum preoperative staging.

Gastrointestinal (Pancreas Focal Lesions and Carcinoma)

Tuesday, 03:00 PM - 04:00 PM • E353C

SSJ09 • AMA PRA Category 1 Credit™: 1 • ARRT Category A+ Credit: 1

Moderator
Fatih Akisik , MD *

Moderator
Christine O Menias , MD

SSJ09-01 • Objective Imaging Criteria for Intraductal Papillary Mucinous Neoplasms of the Pancreas - Diagnostic Predictability and Interobserver Confidence

Thula Walter (Presenter) ; Ingo Steffen ; Lars H Stelter ; Timm Denecke MD ; Marcus Bahra MD ; Bernd K Hamm MD * ; Christian Grieser

PURPOSE
The purpose of this study was to investigate the diagnostic predictability of the histologic entity of IPMNs based on objective imaging criteria, such as the Sendai criteria and observer confidence.

METHOD AND MATERIALS
43 patients with 46 distinct pancreatic lesions, which were histologically confirmed to be IPMNs, were included in this retrospective study.
Intraductal Papillary Mucinous Neoplasm of the Pancreas: Evaluation of Unresectability with MR Only

Seongho Kim (Presenter); Jeong-Min Lee MD *; Eun Sun Lee MD, PhD; Jeeyun Baek MD; Joon Koo Han MD; Byung Ihn Choi MD, PhD *

PURPOSE
To evaluate MRI findings between benign vs malignant IPMNs and noninvasive vs invasive IPMNs. To evaluate MRI performances in differentiating between each other and to evaluate the accuracy for surgical resectability using only MR images with surgery and pathologic analysis as reference standards.

METHOD AND MATERIALS
Informed consent requirement was waived, and institutional review board approval was obtained. 93 patients with pathologically proved as IPMNs (benign, n = 51; high grade dysplasia, n = 17; invasive, n = 25), underwent MRI before the surgery. Qualitative and quantitative image analysis was performed. MRI performances of determining malignancy potential, invasiveness and unresectability were evaluated. Statistical analysis was performed with Fisher’s exact test, Mann-Whitney U test, and ROC curves.

RESULTS
Intramural nodules were observed in 3 benign IPMNs, and 17 malignant IPMNs(P<.00007). Peripancreatic infiltration was observed in 1 benign IPMN, and 7 malignant IPMNs(P>.02). The mean diameter of MPD was 3.4mm and 8.7mm respectively in benign and malignant IPMNs(P=.0014). Intramural nodules were observed in 8 noninvasive IPMNs, and 12 invasive IPMNs(P=.0004). Peripancreatic infiltration was detected in 2 patients with noninvasive IPMNs, and 6 patients with invasive IPMNs(P=.004). The median diameter of MPD was 2mm in noninvasive IPMNs, and 6.4mm in invasive IPMNs(P=.05). MRI performance of determining malignancy potential and invasiveness was obtained by scoring ranging from 1 to 4 (1 as definitely benign or noninvasive, 5 as definitely malignant or invasive). AUC was 0.778 and 0.721, respectively. The unresectability was evaluated by scoring its possibility of resection ranging from 1 to 4 (1 as definitely resectable, 4 as definitely unresectable). AUC was 0.742 with sensitivity 12.5% and specificity 98.82% under the criterion value of >2(P=.01) with moderate agreement between two raters(K=.651).

CONCLUSION
MRI is helpful in differentiation of benign or noninvasive IPMNs from malignant or invasive IPMNs. However sensitivity of evaluating unresectability is significantly low.

Pancreatic Cystic Lesions in Patients with Advanced Liver Disease

Simon Abramson MD (Presenter); Beatrice L Madrazo MD; Seth Scilar; Emmanuel Coronel; Paul Martin; Victor J Casillas MD; David Jativa

PURPOSE
Routine abdominal imaging frequently uncovers unsuspected masses. Recent studies report a prevalence of incidentally detected pancreatic cystic lesions (PCL) in the general population of 2.4% to 2.6% (De Jong 2010, Laffan 2008). We have observed increasing numbers of PCL in cirrhotic patients receiving routine abdominal imaging for hepatocellular carcinoma surveillance. The aim of this study is to establish PCL prevalence in patients with advanced liver disease.

METHOD AND MATERIALS
This was a cross-sectional study comparing three groups of cirrhotic patients: 1) Clinic (hepatology clinic patients, 2010-11), 2) MRI (consecutive patients with cirrhosis and abdominal MRI, 2009-11), and 3) Transplant (liver transplant recipients, 2010-11). Patients with cirrhosis and CT or MR imaging studies were included. For liver-transplanted patients, only pre-transplant images were considered. Key exclusions were age.

RESULTS
Seven-hundred and twenty-three patients were screened and 585 were eligible (cirrhosis with CT or MR scans). From these 585 patients, 65 were excluded due to age, pancreatitis, and polycystic liver and/or kidney disease. Two-hundred and twenty-eight patients were in the Clinic group, 150 in the MRI group, and 142 in the Transplant group. Mean age was 59, 57, and 56 in the 3 groups, respectively. Male patients comprised 69%, 55%, and 75% of the 3 groups, respectively. Additionally, median MELD score and interquartile range in patients with cysts (n=41) was 15 (10-18) and without cysts (n=457) was 11 (9-15), p=.03. PCL prevalence in patients with non-alcoholic steatohepatitis (NASH) related cirrhosis was 4/64 (6.3%) compared to PCL prevalence of 42/456 (9.2%) in all other liver disease (p).

CONCLUSION
Overall, there is a marked increase in PCL prevalence in our cirrhosis cohorts compared to the non-cirrhotic population.

Solid Pseudopapillary Tumor (SPT) of Pancreas

Udayakmal H Barad MD (Presenter); Mark S Frank MD; Mark Tann MD; Temel Tirkes MD; Fatih Akisik MD *; Kumaresan Sandrasegaran MD *

PURPOSE
To describe imaging features of SPT in a Mid-West US population.
RESULTS
Most patients (25/26) were female. The mean age was 25.4 years (range: 8 to 53 years). Eleven patients (44%) were less than 20-years old at presentation. In these, the most common appearance was a thin-walled, cystic, noncalcified mass with internal hemorrhage (10/11). In the eight patients over 25 years, the tumor was a thick walled cystic mass (n=3) or completely solid mass (n=3). Calcification was only seen in two tumors. No metastases were seen. Following tumor resection, no recurrence was seen in any of the patients (n=24) with more than 12 months follow-up (range: 12 to 114 months).

CONCLUSION
SPT presents as a thin-walled cystic mass in younger (teenage) patients, while more solid or thick-walled appearance was seen in over 25 years, suggesting probable evolution of the appearance of tumor with age. Lesion calcification is rare. The prognosis following surgical excision of SPT is good.

CLINICAL RELEVANCE/APPLICATION
Unlike most other cystic pancreatic masses, SPT is usually associated with internal hemorrhage. In older patients, it may present as a solid enhancing mass, simulating a neuroendocrine tumor.

SSJ09-05 • Pancreatic Adenocarcinoma: Comparison of Six MRI Sequences Including Diffusion-weighted Imaging for Tumor Conspicuity
Francois-Xavier Arnaud MD (Presenter); Laurence Legrand; Elodie Sibileau MD; Isabelle Boulay-Coletta MD; Samir Benajaoud; Marc Zins MD

PURPOSE
To assess the best MR sequences among conventional, dynamic contrast-enhanced and diffusion-weighted imaging for pancreatic adenocarcinoma relative conspicuity.

METHOD AND MATERIALS
Our local institutional review board approved this retrospective study and waived the informed consent requirement. 55 consecutive patients with pathologically proven pancreatic adenocarcinoma who underwent MDCT (1.5T, n=25 or 3T, n=30) were retrospectively included. Fat-suppressed (FS) T1-weighted gradient-echo (GRE), FS T2-weighted fast-recovery fast spin echo, 3D FS dynamic T1-weighted gadolinium-enhanced GRE during arterial, portal and delayed phases and diffusion-weighted imaging (DWI) with b values of 0 and 600 or 800 sec/mm2 were obtained. Apparent diffusion coefficient cartographies were generated. For each sequence, two gastrointestinal radiologists independently assessed the lesion's signal intensity relative to non tumoral pancreas and the subjective visual conspicuity using a four-point rating scale (0 to 3). They designated the sequence with the best visual conspicuity. The study coordinator performed a quantitative analysis of the lesion conspicuity on each sequence, placing regions of interest for tumor-to-pancreas contrast (either proximal or distal non tumoral pancreas). Visual conspicuity scores and tumor-to-pancreas contrast ratios in each sequence were compared using paired Wilcoxon or t-tests. p-values were considered statistically significant at p<0.05.

RESULTS
92% of Pancreatic adenocarcinomas appeared hypointense on 3D FS T1 GRE arterial phase, which was the best sequence for tumor conspicuity (2.7), followed by portal phase (2.4) and DWI (2.3)(p<0.05).

CONCLUSION
3D T1 FS GRE arterial phase is the best sequence for pancreatic adenocarcinoma conspicuity. DWI is limited for clear delineation of pancreatic adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION
Contrast-enhanced MRI is highly needed to improve pancreatic adenocarcinoma conspicuity.

SSJ09-06 • CT-evaluation of Extrapancreatic Perineural Invasion in Patients with Resectable Cancer of Pancreatic Head
Ekaterina Kasatkina (Presenter); Vladimir Lyadov; Igor Shrayner; Svetlana Bogomazova; Elena Mershina; Valentin E Snitsyn MD, PhD

PURPOSE
The aim of the study was to find whether multi-detector computed tomography (MDCT) is capable to detect extrapancreatic perineural invasion (EPI) in resectable adenocarcinoma of pancreatic head.

METHOD AND MATERIALS
A retrospective review radiology and pathology database revealed 26 cases of SPT with preoperative imaging. The images were analyzed for size of tumor, location, enhancement characteristics, internal component, local invasion and metastatic disease. Clinical database were used to determine tumor therapy and progression.

RESULTS
All patients underwent Whipple procedure, histologically adenocarcinoma of pancreatic head was confirmed in all patients. Extrapancreatic perineural invasion was found in 25 patients (77,4%), 17 of them showed carcinoma invasion in pancreatic parenchyma. Extrapancreatic perineural invasion was more prominent in larger tumors. All 25 patients with positive PLX-II invasion were correctly diagnosed on preoperative CT-scans. Pattern 1 was found in 16 patients, Pattern 2 in 9 patients. Two false-positive results were present in patients with Pattern 2 which was subtle infiltration of adjacent adipose tissue.

CONCLUSION
MDCT provides sufficient diagnostic information to detect PLX-II invasion on preoperative CT-series in patients with adenocarcinoma of the pancreatic head. Further research, follow-up and prospective studies are needed to confirm the accuracy of MDCT in detecting EPI.

CLINICAL RELEVANCE/APPLICATION
Preoperative detection of EPI which is significant cause of positive surgical margin and tumor recurrence can influence clinical management of patient - choice to perform surgery or neoadjuvant therap
**SSJ10-02 • Preliminary Study of Spectral CT Imaging in the Differentiating Normal and Malignant Residual Stomach Wall Thickening**

**He Qing Wang** MSc (Presenter) ; **Ailian Liu** MD ; **Ye Ju** ; **Sheng Wang** ; **Shifeng Tian** ; **Longmin Zhang**

**PURPOSE**
To investigate the value of spectral CT imaging in the differential diagnosis of normal and malignant residual stomach wall thickening.

**METHODOLOGY AND MATERIALS**
32 cases (pathological finding proved 11 cases of residual stomach cancer, long-term clinical follow-up confirmed 21 cases of Stomach normal postoperative change). Nine patients underwent the plain scan, 23 patients underwent both the plain scan and the dynamic enhancement. With dual-kVp spectral CT imaging, monochromatic images (40-140 keV) and the iodine and water-based material decomposition images were reconstructed. CT values of 70 keV and effective iodine content (eIC) were measured. One-way analysis of variance was performed for analyzing the resulting parameters, and p

**RESULTS**
There was a statistically significant difference between malignant and normal gastric wall tissue in 40-140 keV 101 monoenergetic images: arterial phase 40keV, 50keV, 60keV, 70keV, effective monoenergetic spectrum value, material value based water and iodine and portal phase 40keV, 50keV, 60keV, 70keV, 80keV, effective monoenergetic spectrum value, material value based iodine. Significant differences were seen in 40-140 keV 101 monoenergetic images: arterial phase 40keV, 50keV monoenergetic spectrum value between malignant and normal gastric wall tissue.

**CONCLUSION**
CT Gemstone Spectral Imaging could provide additional imaging information that may improve the differentiation of the normal and malignant wall of the residual stomach. Spectral CT curve is expected to be a new non-invasive method to differentiate them.

**CLINICAL RELEVANCE/APPLICATION**
Using spectral CT multiple parameters might be a new noninvasive method to differentiate the normal and malignant residual stomach wall for the conventional polychromatic CT images.

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**SSJ10-04 • The Value of Diffusion-weighted MR Image in Diagnosing Metastatic Lymph Nodes in Patients with Gastric Cancer**

**Zhuping Zhou** (Presenter) ; **Jian He** MD, PhD ; **Song Liu** ; **Bin Zhu** ; **Zhou Z Ping** ; **Zhengyang Zhou**

**PURPOSE**

**METHODOLOGY AND MATERIALS**
A total of 111 consecutive patients with advanced gastric cancer who underwent both Gadoxetic acid-enhanced MR cholangiography and upper gastrointestinal endoscopy were included in this study. Two 1.5-T MR systems were used: a 1.5-T superconducting system and a 3.0-T superconducting system. Both systems used the same MR cholangiography protocol, and the data was analyzed by a methodologist and radiologist. The results were compared with the pathological findings.

**RESULTS**
Among a total of 111 cases, 39 patients showed metastatic lymph nodes in the stomach. Of these 39 patients, 33 patients had bile reflux gastritis and 3 patients showed bile in the stomach without evidence of erythematous mucosal changes. Of the 72 patients who did not show contrast media in the stomach, none of them had bile reflux gastritis and 2 patients showed bile stain in the stomach without evidence of erythematous mucosal changes. Bile reflux gastritis was significantly more frequent in patients with contrast media in the stomach on Gadoxetic acid-enhanced MR cholangiography (13/39, 33.3%) than those without (0/72, 0%) (p < 0.001). However, there was no significant difference between bile reflux gastritis and the extension grade of reflux (grade 1: 2/12, grade 2: 4/11, grade 3: 7/16) (p = 0.335).

**CONCLUSION**
About a third of patients with biliary excreted contrast media in stomach did not show bile reflux gastritis, and patients who showed bile reflux gastritis were more significantly frequent compared to those without. Biliary excreted contrast media in stomach on Gadoxetic acid-enhanced MR cholangiography obtained at 60 minutes could be an indication of the presence of bile reflux gastritis.

**CLINICAL RELEVANCE/APPLICATION**
Biliary excreted contrast media in stomach on Gadoxetic acid-enhanced MR cholangiography obtained at 60 minutes could be an indication of the presence of bile reflux gastritis.

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**SSJ10-03 • Preliminary Study of Spectral CT Imaging in the Differentiating Normal and Malignant Residual Stomach Wall Thickening**

**He Qing Wang** MSc (Presenter) ; **Ailian Liu** MD ; **Ye Ju** ; **Sheng Wang** ; **Shifeng Tian** ; **Longmin Zhang**

**PURPOSE**
To investigate the value of spectral CT imaging in the differential diagnosis of normal and malignant residual stomach wall thickening.

**METHODOLOGY AND MATERIALS**
32 cases (pathological finding proved 11 cases of residual stomach cancer, long-term clinical follow-up confirmed 21 cases of Stomach normal postoperative change). Nine patients underwent the plain scan, 23 patients underwent both the plain scan and the dynamic enhancement. With dual-kVp spectral CT imaging, monochromatic images (40-140 keV) and the iodine and water-based material decomposition images were reconstructed. CT values of 70 keV and effective iodine content (eIC) were measured. One-way analysis of variance was performed for analyzing the resulting parameters, and p

**RESULTS**
There was a statistically significant difference between malignant and normal gastric wall tissue in 40-140 keV 101 monoenergetic images: arterial phase 40keV, 50keV, 60keV, 70keV, effective monoenergetic spectrum value, material value based water and iodine and portal phase 40keV, 50keV, 60keV, 70keV, 80keV, effective monoenergetic spectrum value, material value based iodine. Significant differences were seen in 40-140 keV 101 monoenergetic images: arterial phase 40keV, 50keV monoenergetic spectrum value between malignant and normal gastric wall tissue.

**CONCLUSION**
CT Gemstone Spectral Imaging could provide additional imaging information that may improve the differentiation of the normal and malignant wall of the residual stomach. Spectral CT curve is expected to be a new non-invasive method to differentiate them.

**CLINICAL RELEVANCE/APPLICATION**
Using spectral CT multiple parameters might be a new noninvasive method to differentiate the normal and malignant residual stomach wall for the conventional polychromatic CT images.
To explore the characteristics of lymph nodes in patients with gastric cancer by diffusion weighted (DW) MR image, and investigate the value of apparent diffusion coefficient (ADC) and short axis measurement in diagnosing metastatic lymph nodes.

METHOD AND MATERIALS

This prospective study was approved by local ethics committee and the patient informed consent was obtained. Fifty-five patients (34 male, 18 female) with gastric cancer underwent preoperative DW MR imaging. All the detectable lymph nodes on DW images were divided into metastatic and non-metastatic groups with the reference of post-operative histopathological findings. The ADC values and short diameter of lymph nodes were measured and compared between the two groups. Diagnostic performance of ADC value and short diameter for diagnosing metastasis were compared by receiver characteristic curve (ROC) analysis.

RESULTS

CONCLUSION
ADC value from DW MR imaging is superior to short diameter measurement in diagnosing metastatic lymph nodes in patients with gastric cancer.

CLINICAL RELEVANCE/APPLICATION
DW imaging could be added into routine preoperative MR imaging of patients with gastric cancer to detect and diagnose lymph node metastasis.

SSJ10-05 • Preclinical Study on CT-optics Hybrid Lymphangiography for Stomach Sentinel Lymph Node Mapping, Labeling and Intra-operative Navigation in a Beagle Model

Hon Soul Kim MD, PhD (Presenter); Sang Kil Lee; Se Hoon Kim; Soo-Jeong Lim; Woo Jin Hyung MD; Joonseok Lim MD

PURPOSE
Multi-modality hybrid imaging of loco-regional lymphatic system would improve preoperative mapping and intra-operative navigation of the sentinel lymph nodes. We assumed that if a reliable method for sentinel lymph node labeling is available, the application of minimally invasive treatment for stomach cancer could be expanded.

METHOD AND MATERIALS
Animal experiments were approved by our institutional animal care and use committee. We developed a nano-scale iodine-indocyanine green oil emulsion that can be used for both CT and optical imaging. We endoscopically injected this hybrid contrast agent in the gastric submucosal compartment of 9 beagles. Serial preoperative CT scans were obtained. The degree of lymph node enhancement was qualitatively and quantitatively measured. Each beagle underwent either open laparotomy, laparoscopy-assisted surgery or robot (equipped with integrated infra-red optical camera)-assisted surgery. Specimen CT and near infra-red fluorescence imaging was performed.

RESULTS
Our lymphangiography method generated significant contrast effect for both CT and near infra-red range optical devices. Significant and persistent accumulation of the hybrid contrast signal was observed in the draining lymphatic system, which remained throughout the entire experiment (over 5 hours) achieving the effect of lymph node labeling. Preoperative CT provided information on anatomy oriented lymph node mapping. We were able to identify 40 lymph nodes showing enhancement on CT scan in 9 beagles. Optical imaging ensured high resolution visualization of both the draining lymph nodes and intervening lymphatic vessels. In addition, adopting intra-operative compatible optical devices (such as Robot-assisted surgery in this study) enabled real time high resolution imaging during surgery, and therefore considerably enhanced the sensitivity and confidence on sentinel lymph node assessment.

CONCLUSION
Our CT-optics based hybrid imaging is a feasible and effective method for lymphangiography, which can be used for preoperative mapping, labeling and intra-operative navigation of sentinel lymph nodes. We believe these advantages can be exploited to design minimally invasive treatment strategies with extended indications.

CLINICAL RELEVANCE/APPLICATION
Nano-scale iodine-indocyanine green oil emulsion based hybrid (CT and optical) lymphangiography can be used for sentinel lymph node assessment and non-invasive treatment of early gastric cancer.

SSJ10-06 • Diagnosis of Esophageal or Duodenal Invasion of Advanced Gastric Cancer: Comparison of CT and Endoscopy

Yoon Jin Lee MD (Presenter); Young Hoon Kim MD, PhD; Ji Hoon Park MD; Kyoung Ho Lee MD; Hye Seung Lee MD; Do Joong Park; Hyung-Ho Kim MD, PhD

PURPOSE
To retrospectively compare the accuracy of CT with that of endoscopy in the diagnosis of esophageal or duodenal invasion of advanced gastric cancer.

METHOD AND MATERIALS
Forty-five patients (26 men, 19 women; median age, 68 years; range, 40–82 years) who underwent gastrectomy and had pathologically confirmed advanced gastric cancer with esophageal or duodenal invasion were included. The preoperative reports of CT and endoscopic exams were compared for the diagnosis of esophageal or duodenal invasion. The longitudinal length of tumor invasion into the esophagus or duodenum was retrospectively measured on CT images and histopathological specimens under microscopy. Other histopathological data were also collected, including the invasion pattern (mucosal or submucosal spread), Borrmann type, and WHO histologic classification. The sensitivity of CT and endoscopy were calculated and histopathological data were evaluated for the association with false negative findings.

RESULTS
The overall accuracy of CT was significantly higher than that of endoscopy (66% [31/47] vs. 38% [18/47], P=.001). CT was significantly more accurate than endoscopy in diagnosing both esophageal (71% [22/31] vs. 45% [14/31], P=.008) and duodenal invasion (56% [9/16] vs. 25% [4/16], P=.013). Longitudinal tumor invasion lengths showed strong correlation between CT (median, 9.4 mm; interquartile range, 5.0–12.8 mm) and histopathologic (median 6.5, interquartile range, 3.3–11.0) measurements (Spearman’s rho=0.86, P

CONCLUSION
CT is more accurate than endoscopy in the diagnosis of esophageal or duodenal invasion in patients with advanced gastric cancer.

CLINICAL RELEVANCE/APPLICATION
CT is more accurate than endoscopy for the prediction of esophageal or duodenal invasion, and may be more helpful for the decision of optimal longitudinal surgical extent.
Quantification of Liver Fat Content in Adolescents with Non-alcoholic Fatty Liver Disease: Comparison of Triple-Echo Chemical Shift Gradient-Echo Imaging and in Vivo Proton MR Spectroscopy

ROSSELLA DI MISCIO ; LUCIA PACIFICO ; MICHELE DI MARTINO (Presenter) ; CONCECCA V LOMBARDO ; FLAVIO FERRARO ; CLAUDIO CHIESA ; CARLO CATALANO MD

PURPOSE
To compare a triple-echo gradient-echo sequence for measuring the fat content of the liver with using hydrogen 1 (1H) magnetic resonance (MR) spectroscopy and liver biopsy as the reference standard.

METHOD AND MATERIALS
In 74 pediatric patients with (42 men, 32 women; mean age, 11 years), 3.0-T single-voxel point-resolved 1H MR spectroscopy of the liver (Cournaud segment VII) was performed to calculate the liver fat fraction from the water (4.7 ppm) and methylene (1.3 ppm) peaks, corrected for T1 and T2 decay. Liver fat fraction was also computed from triple-echo (consecutive...
Ultrasound is an excellent complement to MRE in evaluation of IBD in children and is recommended for follow-up of disease activity in CLINICAL RELEVANCE/APPLICATION preferred method for evaluating disease involvement at presentation. Imaging method for those with nonspecific symptoms or with low-suspicion for having IBD at initial presentation. MRE remains the US can be an excellent complement to MRE particularly for follow-up of disease activity in patients with known IBD and as a primary distal ileum. US remains inferior to MRE for the remainder of the small bowel with less reliability but moderate concordance. Therefore, US is a reliable tool and showed substantial correlation with MRE in detecting inflammatory changes in the colon, terminal ileum and distal ileum. US remains inferior to MRE for the remainder of the small bowel with less reliability but moderate concordance. Therefore, US can be an excellent complement to MRE particularly for follow-up of disease activity in patients with known IBD and as a primary imaging method for those with nonspecific symptoms or with low-suspicion for having IBD at initial presentation. MRE remains the preferred method for evaluating disease involvement at presentation.

CLINICAL RELEVANCE/APPLICATION Ultrasound is an excellent complement to MRE in evaluation of IBD in children and is recommended for follow-up of disease activity in patients with known IBD.
**VSPD32-10 • Relationship of the Detection Rate of Active Pediatric Ulcerative Colitis (PUC) and the Time Interval between MR Enterography (MRE) and Endoscopy**

Mohamed A Aggag MD (Presenter); Jorge H Davila Acosta MD; Carmen Rotaru PhD; Ericc Benchimol MD; David Mack MD

**PURPOSE**
1. To correlate DWI and post gadolinium enhancement (PGE) findings with endoscopy findings in PUC.
2. To evaluate the relationship of detection of active PUC and time interval between MRE and endoscopy.

**METHOD AND MATERIALS**
Retrospective study. Inclusion criteria: Newly diagnosed patients with PUC who underwent MRE and endoscopy between Feb 2010 and Dec 2012. Exclusion criteria: Interval time between studies > 31 days.

**RESULTS**
18 cases in total, 10 in phase 1. Endoscopy was positive in all Re, SC, DC and TC. Decreased Se between phase 1 and 2 for DWI were: Ce 1.0 to 0.67, AC 0.78 to 0.59, TC 0.90 to 0.56, DC 1.0 to 0.72, SC 0.8 to 0.61 and Re 0.8 to 0.6. And for PGE were Ce 0.57 to 0.33, AC 0.44 to 0.29, TC 0.5 to 0.33; DC 0.6 to 0.5, SC 0.4 to 0.33 and Re 0.4 to 0.33. Sp for PGE and DWI were 1.0 in both phases in Ce and AC.

**CONCLUSION**
Endoscopy facilitates fast, accurate and comprehensive workup in pediatric inflammatory bowel disease; without the need for IV contrast administration and eliminating risk of radiation.

**CLINICAL RELEVANCE/APPLICATION**
DWI seems to be able to replace, in any case complement ce-T1-w MRC. In 4 patients DWI presented multiple, discontinuous lesions, while ce-T1-w MRC only showed one.

**VSPD32-11 • MR Colonography including Diffusion Weighted Imaging (DWI) in Children with Inflammatory Bowel Disease (IBD): Do We Really Need Intravenous Contrast?**

Sonja Kinner MD (Presenter); Maria L Hahnemann MD; Bernd Schweiger *; Thomas C Lauenstein MD; Selma Sirin MD

**PURPOSE**
MR colonography (MRC) is a well-accepted, non-invasive imaging modality for the depiction of inflammatory bowel disease. Diffusion weighted Imaging (DWI) has been shown to show lesions in abdominal MRI as good as contrast enhanced imaging and can also be used for bowel imaging. The aim of this study therefore was to assess if contrast enhancement is really needed to depict inflammatory lesions in bowel MRI if DWI is available.

**METHOD AND MATERIALS**
38 patients (18 girls, 20 boys, mean age 14.6 years) underwent MRC on a 1.5T (Magnetom Avanto, Siemens). In addition to T2-weighted and contrast-enhanced T1-weighted (ce-T1-w) data, DWI sequences in axial and coronal plane (b = 50, 500, 1000) were acquired and ADC maps were calculated. Two reviewers evaluated i) DWI, ii) ce-T1-w MRI as well as iii) DWI and ce-T1-w MRC concerning lesions (1=none, 2=one/continuous lesion(s), 3=multiple, discontinuous lesions). Furthermore, bowel distension (1=good, 2=moderate, 3=poor distension) and the preferred b-value (0, 500, 1000) were assessed and correlated. Colonooscopy was performed in the following 48 hours and served as reference standard.

**RESULTS**
Ce-T1-w MRC showed lesions correctly in 32 of 38 patients. All 38 patients were diagnosed correctly with the DWI data set and with a combination of DWI and Ce-T1-w MRC. In 4 patients DWI presented multiple, discontinuous lesions, while ce-T1-w MRC only showed one continuous lesion. Inflammatory bowel parts were detectable even if bowel distension was suboptimal: The missed lesions in ce-T1-w MRC were found in patients with only poor or moderate distension. Kappa values for the two readers were excellent (k=0.82). A combination of the two higher b-values (b=500 and 1000) was preferred for DWI.

**CONCLUSION**
DWI of the bowel shows inflammatory lesions with high accuracy and proved to show lesions that were not seen with ce-T1-w imaging. DWI can be used even in moderately or poorly distended bowel segments and is able to discriminate between one or more continuous or discontinuous lesions. B-values of 500 and 1000 should be used.

**CLINICAL RELEVANCE/APPLICATION**
DWI seems to be able to replace, in any case complement ce-T1-w MRC. This could be used for short examinations for therapy response assessments and has to be evaluated in future trials.

**VSPD32-09 • MR Colonography including Diffusion Weighted Imaging (DWI) in Children with Inflammatory Bowel Disease (IBD): Do We Really Need Intravenous Contrast?**

Sonja Kinner MD (Presenter); Maria L Hahnemann MD; Bernd Schweiger *; Thomas C Lauenstein MD; Selma Sirin MD

**PURPOSE**
MR colonography (MRC) is a well-accepted, non-invasive imaging modality for the depiction of inflammatory bowel disease. Diffusion weighted Imaging (DWI) has been shown to show lesions in abdominal MRI as good as contrast enhanced imaging and can also be used for bowel imaging. The aim of this study therefore was to assess if contrast enhancement is really needed to depict inflammatory lesions in bowel MRI if DWI is available.

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**CONCLUSION**
DWI of the bowel shows inflammatory lesions with high accuracy and proved to show lesions that were not seen with ce-T1-w imaging. DWI can be used even in moderately or poorly distended bowel segments and is able to discriminate between one or more continuous or discontinuous lesions. B-values of 500 and 1000 should be used.

**CLINICAL RELEVANCE/APPLICATION**
DWI seems to be able to replace, in any case complement ce-T1-w MRC. This could be used for short examinations for therapy response assessments and has to be evaluated in future trials.
CONCLUSION
1. The longer the interval between MRE and endoscopy, the lower the detection ratio of active PUC by MRE, this is likely due to treatment response.
2. DWI has better sensitivity than PGE in the detection of active PUC.

CLINICAL RELEVANCE/APPLICATION
These results support that treatment contributes to mucosal healing; therefore, correlation value of endoscopy and MRE is lower in longer time interval, for being considered during MRE interpretation.

VSPD32-11 • IR of Challenging Pediatric Liver Conditions

Philip R John MBChB, FRCR (Presenter)

LEARNING OBJECTIVES
1) To understand the range of hepatobiliary disorders where invasive imaging is required (using vascular and nonvascular interventional techniques).
2) To describe the spectrum of hepatobiliary disorders where IR plays an important role in patient management (hepatic vascular malformations, vascular shunts, transplant issues and the utilization of the liver as a window for cardiac intervention).
3) To emphasize the need for close collaboration and communication between diagnostic and interventional radiology in managing children with hepatobilia.

ABSTRACT

VSPD32-12 • Long-term Outcome of Percutaneous Transhepatic Balloon Dilatation for Anastomotic Stricture at Roux-en-Y Hepaticojejunostomy after Pediatric Living Donor Liver Transplantation

Minoru Yabuta MD (Presenter) ; Toshiya Shibata MD ; Ken Shinozuka ; Toyomichi Shibata MD ; Hiroyoshi Isoda MD ; Kaori Togashi MD, PhD *

PURPOSE
Living donor liver transplantation (LDLT) has been an established treatment for an end-stage liver disease because of shortage of liver graft. Compared with deceased donor liver transplantation, biliary complications more frequently occur in LDLT. Of biliary complications, anastomotic stricture is most common and might sometimes lead to graft loss. The aim of this study is to evaluate the long-term outcome of balloon dilatation and inner drainage following percutaneous transhepatic biliary drainage (PTBD) for anastomotic stricture at Roux-en-Y hepaticojejunostomy after pediatric LDLT.

METHOD AND MATERIALS
Between April 1997 and December 2012, consecutive 39 patients (15 men and, 24 women, age, 0 - 18 years, median 4 years) who underwent LDLT with Roux-en-Y hepaticojejunostomy developed anastomotic stricture 1 - 218 months (median 8 months) after LDLT. They underwent PTBD, balloon dilatation across the anastomotic stenosis, and inner drainage. After serial exchange with larger diameter tube, drainage tube was removed when biliary stricture was improved on the cholangiography and symptom and biochemical findings were improved clinically. We evaluated tube independent rate, the rate of primary patency, primary assisted patency and secondary patency.

RESULTS
In 38 of 39 patients, a drainage tube could be removed. Tube independent rate was 97%. The rate of primary, primary assisted, and secondary patency at 1-, 3-, 5-, 10-years after the initial PTBD were 0.85, 0.77, 0.74, and 0.74 respectively, 0.97, 0.97, 0.97, and 0.97 respectively, and 1.00, 1.00, 1.00, and 1.00 respectively.

CONCLUSION
Balloon dilatation and inner drainage following PTBD was an effective treatment for anastomotic biliary stricture at Roux-en-Y hepaticojejunostomy after pediatric LDLT.

CLINICAL RELEVANCE/APPLICATION
Balloon dilatation and inner drainage following PTBD was an effective treatment in pediatric patients with anastomotic biliary stricture at Roux-en-Y hepaticojejunostomy after LDLT.

VSPD32-13 • Evaluation of the Difference in Radiation Exposure Levels between Image Intensifier and Flat Panel Detector-based Systems in Pediatric Patients with Biliary Strictures Post-liver Transplantation Treated with Interventional Radiological Procedures

Roberto Miraglia MD ; Luigi Maruzzelli MD ; Kelvin Cortis MD, MRCS, FRCR (Presenter) ; Fabio Tuzzolino ; Roberta Gerasia ; Angelo Luca MD

PURPOSE
The aim of this study was to compare radiation exposure levels between biliary interventional procedures performed using an image intensifier and a flat panel detector-based system in liver transplant pediatric patients with biliary strictures (BS).

METHODOLOGY AND MATERIALS
We enrolled 34 consecutive pediatric liver transplant recipients with BS who underwent a total of 170 image-guided procedures in the period between January 2008 and March 2013. The Dose Area Product (DAP) and fluoroscopy time was recorded for each procedure. Mean age was 61 months (range 4 - 192) and mean weight 17 kg (range 4 - 41). The procedures were classified into 3 categories: percutaneous trans-hepatic cholangiography and biliary catheter placement (n=40), cholangiography and balloon dilatation (n=55), cholangiography and biliary catheter change or removal (n=75). Ninety two procedures were performed in an image intensifier-based angiographic system. All of the 78 procedures performed after July 2010 were performed in a flat panel detector-based interventional suite. The difference between the two angiographic systems was compared using the Wilcoxon rank-sum test, using both DAP and fluoroscopy time. The estimates of the differences of DAP adjusted for the fluoroscopy time were assessed with a multiple generalized linear regression model.

RESULTS
Mean DAP in the 3 categories was significantly higher in the group of procedures performed in the image intensifier-based system, as compared to the procedures performed in the flat panel detector-based suite. Statistical analysis revealed a p value of 0.001 in percutaneous transhepatic cholangiogram and biliary catheter placement, 0.002 in the cholangiogram and balloon dilatation, and 0.0001 in the cholangiogram and biliary catheter change or removal group.

CONCLUSION
In our experience, the use of flat panel angiographic equipment reduces radiation exposure in pediatric biliary interventional radiology procedures in children with liver transplantation.

CLINICAL RELEVANCE/APPLICATION
The use of flat panel angiographic equipment should be considered for pediatric interventional radiology procedures.

VSPD32-14 • Free Breathing Radial 3D VIBE- A Possibility to Perform Dynamic Contrast Enhanced Abdominal MRI Examinations of Children under General Anesthesia with an Improved Image Quality
LEARNING OBJECTIVES
1) The findings of liver, spleen and GU trauma will be described. These are mostly widely known and appreciated. 2) The importance of direct vascular injury in these organs will be shown. 3) Injury resulting in potential mortality versus potential morbidity will be addressed. 4) The value of specific imaging technique on identifying and characterizing injury to these organs will be discussed. 5) The limitations of conventional grading systems in these organs will be exposed. 6) A proposed management algorithm for each organ will be described based upon the severity of the injury.

MSES344 • MDCT Techniques in Trauma Imaging

Stephan W Anderson MD (Presenter)

LEARNING OBJECTIVES
1) To discuss the appropriate use of oral and intravenous contrast in trauma imaging using CT. 2) To discuss the applications of multi-phasic imaging in trauma using CT. 3) To delineate methods to limit radiation in trauma imaging with MDCT. 4) To illustrate relevant imaging findings for a range of clinically relevant traumatic injuries using MDCT.

MSES34B • Liver, Spleen, and GU Trauma

Brian C Lucey MBCh (Presenter)

LEARNING OBJECTIVES
1) The findings of liver, spleen and GU trauma will be described. These are mostly widely known and appreciated. 2) The importance of direct vascular injury in these organs will be shown. 3) Injury resulting in potential mortality versus potential morbidity will be addressed. 4) The value of specific imaging technique on identifying and characterizing injury to these organs will be discussed. 5) The limitations of conventional grading systems in these organs will be exposed. 6) A proposed management algorithm for each organ will be described based upon the severity of the injury.
ABSTRACT
Blunt abdominal trauma is all too common and frequently results in significant morbidity, and in many cases, mortality. Early recognition of injury with potential to result in death is preferable. Imaging that may predict significant morbidity is also useful to enable prompt early treatment to limit morbidity. Conventional grading systems for abdominal organ injury, although useful in their day, are now outdated and do not take into account the progress made in imaging since these systems were devised. Injury to vessels resulting in prolonged bleeding is the cause of mortality and this may be established with dedicated vascular imaging now available and we no longer rely on the size of laceration to predict outcome even in the solid parenchymal organs of the abdomen. Morbidity may also be predicted based on imaging and early treatment instituted where appropriate. The purpose of this talk will be to outline the imaging techniques required to optimize injury detection and characterization, classify injuries according to modern imaging techniques and put forward an proposed management plan for all types of injury to the liver, spleen and GU tract.

MSES34C • Bowel, Mesentery, and Pancreatic Trauma
Jorge A Soto MD (Presenter) *

LEARNING OBJECTIVES
1) Review CT findings associated with bowel, mesenteric and pancreatic trauma. 2) Explain concepts of CT technique that are relevant to evaluation of patients with bowel and pancreatic trauma. 3) Apply CT findings for adequate therapy for patients with blunt pancreatic and bowel injuries.

ABSTRACT
Although injuries to the pancreas, hollow viscera and mesentery are rare, they are important because delays in diagnosis as short as 8 to12 hours increase the morbidity and mortality from peritonitis and sepsis. Thus, radiologists need to be aware of the often subtle CT signs that are found in these injuries. Signs of bowel injury include focal wall discontinuity, extraluminal gas or oral contrast material (on the rare occasions when it is administered), focal wall thickening and abnormal bowel wall enhancement. Signs of mesenteric trauma include focal mesenteric hematoma, peritoneal extravasation of intravenous contrast-enhanced blood, abrupt termination of a mesenteric vessel and ill-defined increased attenuation (stranding) of the mesentery. The importance of each individual finding varies: the more specific signs are not highly sensitive, and the more sensitive signs are not highly specific. Although free intraperitoneal fluid occurs in both both and mesenteric injuries, this finding in isolation (i.e., without other suspicious signs) lacks specificity. The amount of fluid present, the mean attenuation and the location of the fluid collections are helpful when making management decisions. Pancreatic trauma usually occurs in association with injuries to the liver, spleen or bowel. The diagnosis of pancreatic injuries on CT relies on the identification of direct signs, such as contusions or lacerations, and indirect signs, such as fluid in the peripancreatic fat or in the plane separating the pancreas from the splenic vein and thickening of the left anterior renal fascia. In problematic cases, MR with MRCP may provide additional clues to help in the diagnosis.

Gastrointestinal: Tumor Response Assessment

Tuesday, 04:30 PM - 06:00 PM • E350

RC409 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5

RC409A • RECIST and Other Criteria
Vahid Yaghmai MD (Presenter)

LEARNING OBJECTIVES
1) To review the concepts behind development of anatomic imaging biomarkers. 2) To learn the strengths and weaknesses of RECIST and other anatomic imaging biomarkers. 3) New criteria for evaluation of gastrointestinal tumor response assessment.

ABSTRACT
Improvements in imaging technology and therapeutic options for the management of gastrointestinal tumors have revolutionized the way tumor response to therapy is assessed. Cytotoxic therapies result in tumor shrinkage and their efficacy is commonly assessed by evaluating tumor size based on strict guidelines such as the Response Evaluation Criteria in Solid Tumors (RECIST). This review will familiarize radiologists with the steps that have led to the development and modifications of the RECIST. New cytostatic and locoregional therapies may not change tumor size and have exposed many weaknesses of the RECIST. As a result, tumor and therapy specific response assessment criteria have been developed. These new criteria, including Choi, EASL, mRECIST and irRCC will also be discussed.

RC409B • CT and MR Perfusion Imaging
Dushyant V Sahani MD (Presenter)

LEARNING OBJECTIVES
1) Understand newer concepts in oncology including tumor angiogenesis and the evolving role of imaging biomarkers in drug trials. 2) Discuss the basic principles of CT-MR perfusion and limitations of each method. 3) Develop basic knowledge and skills for acquisition and interpretation of perfusion imaging in the abdomen and pelvis. 4) Assess the potential of perfusion imaging in the oncology trials and in non-oncologic clinical settings.

RC409C • Diffusion-Weighted Imaging
Ihab R Kamel MD, PhD (Presenter) *

LEARNING OBJECTIVES
1) Discuss the basic concepts for DWI in body applications. 2) Describe the emerging role of DWI in assessing response in cancer. 3) Discuss the application of DWI in whole body imaging.

ABSTRACT
Diffusion-weighted magnetic resonance imaging (DWI) can provide functional information at a cellular level by measuring water diffusion values. DWI is sensitive to changes in the micro diffusion of water and the apparent diffusion coefficient (ADC) is an indicator of the movement of water within the tissue. In abdominal oncology, DWI has been successfully used in assessing treatment response of liver tumors. In addition, ADC values have been shown to predict tumor response to treatment. In some instances low tumor ADC before treatment can be predictive of better outcome. Assessing response of the entire tumor volume may be more valuable than a single ROI measurement. Moreover, multiparametric response maps that include changes in both ADC and enhancement after therapy are more predictive of response and patient survival compared to ADC alone or enhancement alone. We will review the different response criteria for various liver tumors treated with intra arterial therapy. New application of DWI including whole body applications will also be discussed.

RC409D • PET-MR-What Do We Know in 2013
Raj M Paspulati MD (Presenter)

LEARNING OBJECTIVES
1) To understand the PET-MR technology, types of current PET-MR scanners and challenges. 2) To understand the clinical application, comparison with PET-CT, protocols and optimizing work flow. 3) To understand the pitfalls, artifacts and future of PET-MR.
ABSTRACT
Introduction of PET-CT had substantial influence on cancer staging and has become a standard practice of care in certain types of cancer staging, restaging and document tumor response to treatment. The low soft tissue contrast of the CT, especially the low dose non-contrast CT is the main limitation of hybrid PET-CT imaging. MR imaging proved to be superior to even contrast enhanced CT certain anatomical regions such as pelvis, head and neck due to its excellent soft tissue contrast resolution. There has been a quest for combined PET;MRI system to provide anatomical, physiological and molecular information with single integrated imaging. The main hurdle has been the sensitivity of PET photomultiplier tubes to magnetic field. This is overcome and integrated PET-MR systems are now available for clinical practice. There are currently two types of integrated PET-MR systems available from two different vendors. In the sequential type the photomultiplier tubes of PET are shielded from magnetic field by separating the PET and MR gantries. In the simultaneous type photomultiplier tubes and MR coils are integrated in one system by using magnetically insensitive avalanche photo diodes. Both these systems have some advantages and disadvantages, but have common challenges. MR attenuation correction is the major challenge faced by both type of systems. World wide, there is limited literature available on the utility and clinical application of the PET-MR system. There has been lot of enthusiasm as well as anxiety in incorporating this integrated system into clinical practice by radiologists as well as physicians involved in managing cancer patients. This refresher course addresses these issues of clinical PET;MR system, key areas where they have impact on patient care and management. At the end of the course the attendees of the course will be familiar with current types of PET-MR systems, clinical applications in oncology, advantages, limitations, pit falls and challenges.

Quantitative CT and MR Perfusion Imaging
Tuesday, 04:30 PM - 06:00 PM • S504AB

LEARNING OBJECTIVES
1) To understand the principles of CT perfusion analysis for tumor assessment. 2) To understand the pathophysiological basis of CT perfusion parameters for tumors. 3) To understand unique CT perfusion analysis of the liver due to its characteristic dual blood supply. 4) To describe the potential clinical applications in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. These presentations will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on hepatic and extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

RC417A • CT Perfusion in Oncology: Hepatic Imaging
ABSTRACT
With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumour blood flow, blood volume, mean transit time, and permeability-surface area product through standard kinetic models, are attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. This presentation will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

LEARNING OBJECTIVES
1) Understand the key technical principles of Dynamic Susceptibility Contrast, Arterial Spin Label, and CT Perfusion Imaging. 2) Know the basic MR pulse sequences and CT acquisition schemes for perfusion imaging. 3) Appreciate the strengths and weaknesses between CT and MR Perfusion imaging methods. 4) Understand the Central Volume Principle, Diffusible Tracer, and Deconvolution Methods.

Technical Considerations for Perfusion Imaging: CTP, DSC, and ASL
Roland Bammer PhD (Presenter) *

LEARNING OBJECTIVES
1) Understand the difference between quantitative and qualitative perfusion measurements. 2) Distinguish several approaches for obtaining quantitative perfusion maps in the brain. 3) Appreciate the strengths and weaknesses between the two major techniques, arterial spin labeling and bolus contrast dynamic susceptibility imaging.

Imaging in Practice: DWI in the Abdomen and Pelvis (How-to Workshop)

Tuesday, 04:30 PM - 06:00 PM • E261

MR GU GI

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Technical Considerations for Perfusion Imaging: CTP, DSC, and ASL
Roland Bammer PhD (Presenter) *

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used as well as the selection of b-values acquired. The ADC of a tissue describes how quickly signal decreases as the b-value is increased. Those lesions with high diffusivity will have high ADC values, while those lesions with reduction will have lower ADC values. In addition to ADC, other parameters have been described that affect the measured diffusivity. The most commonly discussed is intravoxel incoherent motion (IVIM) that is thought to represent the random movement of blood within the capillary system, often called pseudodiffusion. This parameter has its greatest effect on diffusion weighted images at low b-values.

**RC451C • Applications of DWI in Clinical Practice - When It Does and Doesn't Help**

Frank H Miller MD (Presenter)

**LEARNING OBJECTIVES**
1) Demonstrate the utility of diffusion weighted imaging in the abdomen. 2) Show advantages and limitations of diffusion weighted imaging in the abdomen.

**ABSTRACT**
Diffusion weighted imaging (DWI) has been used in neuroimaging for many years. It has only more recently become feasible in the abdomen. The objective of this talk is to emphasize the important role that diffusion-weighted imaging can have in your practice and that it can be used routinely without difficulty in the abdomen and pelvis. DWI potentially can detect lesions that are not as well seen on conventional imaging. DWI helps in characterization of lesions but does have limitations in specificity which will be discussed. Qualitative and quantitative evaluation can be performed and the applications of these techniques clinically will be described. The strengths and limitations of DWI in multiple organs including the liver, pancreas, adrenal gland, kidney, and evaluation for metastases and infections will be discussed. DWI is especially helpful for identify lymph node and peritoneal metastases. Emerging techniques include the use of diffusion weighted imaging to assess response to therapy following liver-directed therapy will also be discussed. In summary, DWI should be used routinely if not being used at your institution. This talk will show benefits and limitations of DWI in a number of organs in the body.

**Gastrointestinal: Abdominal Masses (An Interactive Session)**

**Wednesday, 08:30 AM - 10:00 AM • E450B**

**RC509 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5**

Jay P Heiken, MD
Erik K Paulson, MD
Zhen J Wang, MD
David J Disantis, MD

**LEARNING OBJECTIVES**
1) Learn the characteristic features of some common and atypical abdominal masses. 2) Understand how newer techniques, such as gadoxetate-enhanced MRI and diffusion-weighted imaging, help to identify and characterize abdominal masses. 3) Identify the key imaging findings that assist surgeons or oncologists treating specific abdominal masses.

**Abdominal MRA Update**

**Wednesday, 08:30 AM - 10:00 AM • N230**

**RC529 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5**

**RC529A • Non-contrast MRA of the Abdomen**
Scott B Reeder, MD, PhD (Presenter)

**LEARNING OBJECTIVES**
1) Understand the underlying principles of non-contrast MRA. 2) Be familiar with the currently available methods for non-contrast MRA. 3) Be familiar with important applications and examples of non-contrast MRA. 4) Understand current limitations and pitfalls associated with non-contrast MRA.

**RC529B • Blood Pool MR Contrast Agents: Clinical Applications and Caveats**
Mellena D Bridges, MD (Presenter)

**LEARNING OBJECTIVES**
1) Describe the differences between the in vivo behavior of blood pool and conventional MRI contrast agents. 2) Match the clinical indication with the appropriate contrast agent. 3) Determine the best imaging protocol. 4) Describe potential pitfalls and methods for dealing with them.

**ABSTRACT**

**RC529C • Deep Inferior Epigastric Perforator MRA for Planning Breast Reconstruction**
Nanda Deepa Thimmappa, MD, MBBS (Presenter)

**LEARNING OBJECTIVES**
1) Learn how to image perforator vessels for autologous breast reconstruction. 2) Understand anatomic and surgical considerations for determining the optimum vessel/donor sites for microsurgical breast reconstruction. 3) Review the perforator findings from a spectrum of cases. 4) See a systematic approach to post-processing and reporting perforator studies.

**Imaging in Practice: MRI of the GIT (How-to Workshop)**

**Wednesday, 08:30 AM - 10:00 AM • E261**

**RC551 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5**

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SSK05-01 • CT Colonography (CTC): Extracolonic Findings in a Public Organized Screening

Gabriella Iussich MD (Presenter) * ; Loredana Correale PhD * ; Carlo Senore MD * ; Nereo Segnan ; Cesare Hassan ; Daniele Regge MD ; Paolo Falco * ; Stefania Montemezzi MD ; Alberto Bert PhD *

PURPOSE
To evaluate the frequency and costs of additional diagnostic workup for extracolonic findings (ECFs) detected at CTC in a public organized screening program.

METHOD AND MATERIALS
CTC cases performed within a randomized multi-center screening trial were included in this study. The trial enrolled asymptomatic persons aged 58-60 years undergoing low-dose CTC screening without contrast material. CTCs were prospectively read by experienced radiologists; positive patients (ie, polyps >5-mm) were referred for colonoscopy. All ECFs reported in the initial report were reviewed by two radiologists and were classified as being of high/moderate significance (E4 or E3) vs. minor (E2). Any ambiguity regarding clinic significance of ECFs was resolved with meeting consensus. ECFs assigned to E4 or E3 category were referred for additional workup. Costs of diagnostic procedures due to ECFs reported in the initial report were reviewed by two radiologists and were classified as being of high/moderate significance (E4 or E3) vs. minor (E2). Any ambiguity regarding clinic significance of ECFs was resolved with meeting consensus. ECFs assigned to E4 or E3 category were referred for additional workup. Costs of diagnostic procedures due to additional testing included: ultrasound (n=19); CT scan (n=6) and other diagnostic imaging (n=8). The mean costs for additional evaluation were $2 (95% CI: $1.3-$3.0) per participant and $101 (95% CI: $78-$126) per individual with having previously identified ECFs. Additional testing included: ultrasound (n=19); CT scan (n=6) and other diagnostic imaging (n=8). The mean costs for additional evaluation were $2 (95% CI: $1.3-$3.0) per participant and $101 (95% CI: $78-$126) per individual with ECFs detected high/moderate ECFs. Detection of important ECFs was not related to patient gender (P=0.31) and age (P=0.13). However, important ECFs were more likely to be detected in positive screening results vs. negative screening results (ORs, 4.1; 95% CI:1.8-8.1; P

RESULTS
Of the 1652 (851 men) included subjects, 71 ECFs were found in 68 (4.1%) patients, with 31 (1.9%) of minor significance; 26 (1.5%) moderate and 11 (0.7%) high. The most common E4 findings were ovarian mass (n=2), urinary tract mass (n=2) and, pulmonary nodule >9mm (n=2). Further diagnostic workup was recommended in 37 (2.2%; one per 45 patients) of patients, including 3 patients having previously identified ECFs. Additional testing included: ultrasound (n=19); CT scan (n=6) and other diagnostic imaging (n=8). The mean costs for additional evaluation were $2 (95% CI: $1.3-$3.0) per participant and $101 (95% CI: $78-$126) per individual with detected high/moderate ECFs. Detection of important ECFs was not related to patient gender (P=0.31) and age (P=0.13). However, important ECFs were more likely to be detected in positive screening results vs. negative screening results (ORs, 4.1; 95% CI:1.8-8.1; P

CONCLUSION
About 2% of asymptomatic subjects participating in a public organized CTC screening program will present important ECFs (one per 45 examinations). Early detection of important diseases may add benefit to screening intervention outweighing the incremental costs for diagnostic procedures (mean cost, $2 per participant).

CLINICAL RELEVANCE/APPLICATION
Our results provide information regarding the estimate of important ECFs rate in an organized CTC screening program and should be considered carefully to evaluate ECFs related costs and benefit.

SSK05-02 • Initial Endoscopy Following Screening CT Colonography: Confirmed versus Discordant Polyps

Bryan D Pooler MD (Presenter) ; Perry J Pickhardt MD * ; David H Kim MD *

PURPOSE
Endoscopy (optical colonoscopy or flexible sigmoidoscopy) with polypectomy is recommended following significant findings at CT colonography (CTC). Our purpose was to analyze the difference between colon polyps detected at screening CTC that were subsequently confirmed at initial endoscopy and those that were discordant (not found).
METHOD AND MATERIALS
We collected data from 7157 consecutive adult patients (mean age 56.6±7.2 years, M:F 3285:1051) undergoing first-time screening CTC over an eight-year period at a single academic center. A total of 1051 patients were positive for polyps =6 mm at CTC. Of these, 751 patients with a total of 1272 polyps =6 mm went to endoscopy. Characteristics of all polyps detected at CTC—including size, location, morphology, and diagnostic confidence—were recorded, and those polyps confirmed at endoscopy were compared against those that were discordant.

RESULTS
Of 1272 colon polyps =6 mm in diameter that went to endoscopy, 1153 (89.7%) were confirmed and 119 (10.3%) were discordant. Polyps confirmed were more likely to be sessile (63.1% vs 46.2%, p<0.001). For polyps detected at screening CTC, there were significant differences seen in polyp morphology, polyp location, and diagnostic confidence between those confirmed at initial endoscopy versus those that were discordant.

CONCLUSION
Discordant polyps at initial endoscopy following screening CTC are more likely to be flat lesions, right-sided, and called with low diagnostic confidence.

SSK05-03 • Post-surgery Follow-up Colonoscopy of the Colon Proximal to an Occlusive Cancer, Which Was Found Negative on Pre-surgery CT Colonography

Bohyun Kim MD (Presenter) ; Seong Ho Park MD * ; Jong Seok Lee ; Ah Young Kim MD ; Hyun Kwon Ha MD

PURPOSE
To suggest the optimal timing for follow-up colonoscopy of the proximal colon after surgical resection of an occlusive cancer when pre-surgery CT colonography (CTC) was negative in the proximal colon.

METHOD AND MATERIALS
461 consecutive patients with occlusive colorectal cancer underwent CTC for proximal colonic evaluation, of which 304 patients were negative in the proximal colon on adequately performed CTC. Excluding those who underwent surgical removal of the proximal colon or palliative ostomy (n=88) and those whose post-surgery colonoscopy was absent (n=42), 174 patients (M:F, 86:88; age, 58±11 years) operated on between January 2006 and March 2010 constituted the cohort for this study. Results of all post-surgery colonic examinations were reviewed. Pathology, size, and the time from CTC to colonoscopic identification of proximal colonic lesions were collected. The time from CTC to the first discovery of any clinically relevant lesion (i.e. adenoma 6 mm or greater, advanced adenoma, or cancer) in the proximal colon was analyzed using Kaplan-Meier method and the cumulative risk of the clinical relevant lesions across the follow-up time was calculated.

RESULTS
Length of the colonic follow-up was 3-81 months (median, 33), during which 1-8 colonoscopies per patient (median, 2) were performed (a total of 5444 patient-months and 368 colonoscopies). The probability (standard error) of not having any clinically relevant lesions in the proximal colon at 6 months and at 1, 1.5, and 2 years was 97.6% (1.2%), 96.4% (1.5%), 91.2% (2.3%), and 89.5% (2.6%), respectively. 152 patients did not develop any clinically relevant lesions for 3-76 months (median, 31). 15 patients were found having nonadvanced adenomas 6 mm or greater at 4-68 months (median, 18). 7 patients presented with advanced adenomas at 6-43 months (median, 13). None was postsurgically identified as having cancers in the proximal colon.

CONCLUSION
If the colon proximal to an occlusive cancer was negative on adequately performed CTC, the probability of finding clinically relevant lesions in the proximal colon postsurgically was fairly low until 1 year after the CTC (cumulative risk of 3.6%) although advanced adenoma was found as early as at 6 months.

CLINICAL RELEVANCE/APPLICATION
Additional colonoscopy at 3-6 months post surgery for evaluating the colon proximal to occlusive cancer currently recommended may not be necessary if preoperative CTC was well performed and negative.

SSK05-04 • Feasibility of Ultra-low kVp CT Colonography: Effect of Different Iterative Reconstruction Algorithms on Radiologists’ Performance Using Anthropomorphic Colonic Phantoms

Cheong-II Shin MD (Presenter) ; Se Hyung Kim ; Eun Sun Lee MD, PhD ; Dong Ho Lee MD ; Eui Jin Hwang ; Se-Yeong Chung ; Jeong-Min Lee MD * ; Joon Koo Han MD ; Byung Ihn Choi MD, PhD *

PURPOSE
To analyze the effect of a decrease in tube voltage from 100~120kVp to 80kVp in CT colonography (CTC) on dose, image noise, and diagnostic performance using anthropomorphic phantoms and to assess the effect of two different iterative reconstruction algorithms on radiologists’ performance.

METHOD AND MATERIALS
Seven colon phantoms with 68 simulated polyps =6mm were scanned at different kVp settings (80, 100, and 120kVp) and 10mAs. Images were reconstructed using filtered back projection (FBP), statistical model-based iterative reconstruction (IDOSE), and knowledge-based iterative reconstruction algorithm (IMR). Nine datasets for each phantom according to 3 kVp settings and 3 reconstruction algorithms yielded 63 CTC datasets. Volume CT dose index (CTDIvol) and image noise were recorded and compared. Two readers blinded to kVp and reconstruction algorithm independently reviewed CTC using primary 3D rendering. Per-polyv sensitivity was compared among the datasets.

RESULTS
Decreasing tube voltage from 120 and 100 to 80kVp resulted in 70.7% and 50.5% significant reduction in CTDIvol, respectively (P<0.05). Effective radiation dose of 80kVp CTC was 0.17mSv. With FBP reconstruction, image noise in 80kVp was significantly increased by 67.8% and 45.5%, respectively (P=0.018) and per-polyv sensitivity of both reviewers (14.7%, 7.4%) was significantly lower than those in 100kVp (57.4%, 39.7%) and 120kVp (85.3%, 83.8%) (P<0.05). In 80kVp, per-polyv sensitivity dropped to 52.6% compared to those in 100kVp (P=0.018) but, per-polyv sensitivity (79.4%, 66.2%) in 80kVp was still significantly lower than those in 100kVp (95.6%, 86.8%) and 120kVp (95.6%, 89.7%) (P<0.05). IMR was not significantly different from those in 100kVp (100%, 95.6%) and 120kVp (100%, 95.6%) for both reviewers (P>0.05).

CONCLUSION
A decrease in tube voltage to 80kVp results in a significant reduction of radiation dose to 0.17mSv at a cost of significant deterioration in image noise and diagnostic performance. With application of knowledge-based iterative reconstruction algorithm, radiologists’ performance of 80kVp CTC is acceptable and is on par with 100 or 120kVp CTC.

CLINICAL RELEVANCE/APPLICATION
Ultra-low kVp CT colonography with 80 kVp can be feasible with an application of knowledge-based iterative reconstruction algorithm, significantly lowering the radiation dose with sub-mSv.

SSK05-05 • Reduce CT Colonography (CTC) Radiation Dose Using Model Based Iterative Reconstruction (MBIR) while Maintaining Image Quality

Patrick Miller MD (Presenter) ; Wendy L Stiles MD ; C. Daniel Johnson MD * ; Jeffrey T Lund MD ; Robert G Paden ; Qing Wu ; Amylou Dueck PhD ; Amy K Hara MD *
**SSK05-07 • Effect of Different Reconstruction Algorithms on Computer-aided Diagnosis (CAD) Performance in Ultra-low Dose CT Colonography**

*Eun Sun Lee, MD, PhD (Presenter); Se Hyung Kim; Jong Pil Im; Sang Gyun Kim; Cheong-II Shin, MD; Joon Koo Han, MD; Byung Ihn Choi, MD, PhD*

**PURPOSE**
To assess the effect of different reconstruction algorithms on computer-aided diagnosis (CAD) performance in ultra-low dose CT colonography (CTC).

**METHOD AND MATERIALS**
Twelve patients who underwent same-day CTC and colonoscopy were prospectively enrolled. Non-contrast CTC was performed with 120kVp/10mAs in supine and 100kVp/10mAs in prone. Fecal tagging was done with 50ml of iodinated contrast agent (gastrografin®). CTC images were reconstructed with two different reconstruction algorithms: filtered back projection (FBP), 80% adaptive statistical iterative reconstruction (ASIR80), and model-based iterative reconstruction (MBIR, VEO) algorithm. Commercial CAD (ColonCAD®, Philips Medical Systems) was applied to CTC dataset. Per-polyp sensitivity and the number of false-positives (FP) were recorded and compared among the reconstruction algorithms using McNemar test and Friedman test, respectively.

**RESULTS**
Mean effective radiation dose of CTC was 1.02 mSv (range, 0.94 ~ 1.12 mSv). Forty-seven polyps were detected and removed by colonoscopy. Of them, 27 polyps were detected in each supine and prone CTC dataset. Therefore, 24 CTC datasets of 12 patients contain 54 visible polyps (8 polyps per-patient). No polyp sensitivity of CAD was not acceptable in ultra-low dose CTC with FBP reconstruction. However, it can be improved with an application of iterative reconstruction algorithm with insignificant increase in false-positive. Between the two iterative reconstruction algorithms, ASIR might be more beneficial than MBIR on CAD performance in terms of both per-polyp sensitivity and the number of false-positives.

**CONCLUSION**
Per-polyp sensitivity of CAD was not acceptable in ultra-low dose CTC with FBP reconstruction. However, it can be improved with an application of iterative reconstruction algorithm with insignificant increase in false-positive. Between the two iterative reconstruction algorithms, ASIR might be more beneficial than MBIR on CAD performance in terms of both per-polyp sensitivity and the number of false-positives.

**CLINICAL RELEVANCE/APPLICATION**
With application of hybrid-iterative reconstruction algorithm, CAD can show acceptable per-polyp sensitivity for polyps =10mm and number of false-positive even in ultra-low dose CT colonography.
To evaluate the effect of optimized computer-aided detection (CAD) on the performance of human readers in the detection of non-polypoid flat lesions in asymptomatic patients from a large multi-center CT colonography (CTC) clinical trial.

METHOD AND MATERIALS
A total of 200 cathartic CTC cases including colonoscopy-confirmed, morphologically flat lesions and normal examinations were sampled from a European multi-center CTC trial for asymptomatic patients at increased risk of colorectal cancer. Iodine tagging without or with barium was used in 1/3 of the cases. An expert radiologist who did not otherwise participate in the study annotated the precise locations of flat lesions in the CTC data based on prospective CTC and segmentally unblinded colonoscopy reports. The case reading order was designed to distribute the positive CTC cases evenly between quartiles. Two readers (expert and non-expert) reviewed the 200 CTC cases and recorded all detected lesions using primary 3D interpretation and a CAD second read paradigm, where the CAD that was developed at our institution had been trained with cases independent from this study. The per-patient sensitivities for flat lesions were compared between unassisted and CAD-assisted readings.

RESULTS
There were 34 patients (17%) with morphologically flat lesions: 17 patients had 18 flat lesions =10 mm and 17 had 27 flat lesions 6-9 mm, of which standalone CAD yielded 94% per-patient (89% per-polyp) sensitivities at 4 false positives per patient. For the flat lesions =10 mm, per-patient (per-polyp) sensitivities of the expert reader for unassisted and CAD-assisted readings were 59% (56%) and 71% (67%), respectively, whereas those of the non-expert reader were 41% (39%) and 47% (44%), respectively. For 6-9 mm flat lesions, the corresponding per-patient (per-polyp) sensitivities of the expert reader were 59% (48%) and 71% (59%), respectively, whereas those of the non-expert were 47% (37%) and 71% (63%), respectively.

CONCLUSION
The use of CAD optimized for the detection of flat lesions substantially increased the sensitivity of human readers in the detection of flat lesions in asymptomatic patients.

CLINICAL RELEVANCE/APPLICATION
Colorectal flat lesions were difficult to be found by reader. CAD may improve sensitivity for flat lesion.

SSK05-09 • Reproducible Quantitative Assessment of Colonic Morphology Using Novel CTC Software: Men versus Women

Charles N Weber MD (Presenter); Anna S Lev-Toaff MD; Jason Poff MD; Andrew S Wilmot MD; Hanna M Zafar MD; Marc S Levine MD; Sandra Sudarsky MD; Lutz Guendel MD; Bernhard Geiger MD

PURPOSE
We developed novel CTC software for the purpose of performing reproducible quantitative analysis of colonic morphology. Using this method, our aim was to determine if there are significant differences between genders which may explain higher rates of incomplete optical colonoscopy among women.

METHOD AND MATERIALS
CTC datasets from 20 men and 20 women with incomplete optical colonoscopies and no acute symptoms were compared using software to determine total and segmental colonic length, volume, tortuosity (number of acute angles with 8cm limbs), compactness (boxed volume containing colon or segments divided by respective lengths), and height of the sigmoid apex relative to the lumbosacral junction. Quantitative assessment of the datasets was performed twice each by two different readers on different occasions. Statistical analyses were performed using the unpaired two-tailed student’s T-test. Intra-reader and inter-reader reliabilities were evaluated using the concordance correlation coefficient.

RESULTS
Women had greater tortuosity (turns) of the total colon (10.60 vs 7.53, p values calculated in benign lesions were: RAE 15,98%, RVE 89,17%, RLE 121,12%, ME 1103,94%, MRE 130,64%, TTP 169,4 sec for

CONCLUSION
Our novel CTC software enables reproducible detailed quantitative analysis of colonic morphology. Significant differences found between the genders in tortuosity, compactness, volumes, and sigmoid apex height may explain differences in optical colonoscopy performance. This software may have other beneficial applications for CTC.

CLINICAL RELEVANCE/APPLICATION
Detailed quantitative assessment of colonic morphology is both feasible and reproducible, and may help us to identify patient groups who are at increased risk for incomplete optical colonoscopy.

Gastrointestinal (Focal Liver Lesions and Metastases)

Wednesday, 10:30 AM - 12:00 PM • E350

SSK06 • AMAPRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5

Moderator
Claude B Sirlin MD, MD
Moderator
Mark E Lockhart MD
Moderator
Kathryn J Fowler MD

SSK06-01 • Detection and Characterization of Focal Liver Lesions: Added Value and Diagnostic Accuracy of Dynamic Contrast Magnetic Resonance Perfusion Imaging

Maddalena Colombo MD (Presenter); Davide Ippolito MD; Pietro A Bonaffini MD; Davide Fior MD; Orazio Minutolo MD; Sandro Sironi MD

PURPOSE
To assess the diagnostic accuracy of dynamic susceptibility contrast-enhanced perfusion images in differentiation between benign and malignant focal liver lesions by the assessment of tumoural perfusion kinetics.

METHOD AND MATERIALS
A total of 73 patients with known focal liver lesions including 45 benign (16 FNH, 27 angiomas, 2 abscesses) and 28 malignant ones (17 metastases, 6 HCCs, 2 colangiocarcinoma) underwent 1.5 T MRI (Achieva, Philips) upper abdominal study with a phase array multi-coil and with standard protocol that included dynamic study. On dedicated workstation, time-intensity curves were created in order to generate color permeability maps, showing perfusion of enhancing tumors. ROIs were manually drawn inside the focal liver lesions and on the normal hepatic parenchyma. Perfusion data, as relative arterial, venous and late enhancement (RAE, RVE, RLE%), maximum enhancement (ME%), relative enhancement (RE%), time to peak (TTPsec) were statistically analyzed.

RESULTS
All the diagnosis were established either by histopathology or imaging follow-up (size increase of over a period of time). Perfusion mean values calculated in benign lesions were: RAE 15,98%, RVE 89,17%, RLE 121,12%, ME 1103,94%, MRE 130,64%, TTP 169,4 sec for angiomas; RAE 79,82%, RVE 93,28%, RLE 81,99%, ME 1100,66%, MRE 98,28%, TTP 89,62 sec for FNH; RAE 5,6%, RVE 15,1%, RLE 38,8%, ME 123,4%, MRE 29,9%, TTP 181,8 sec for abscesses. Perfusion mean values calculated in malignant lesions were: RAE 38,43%, RVE 89,17%, RLE 121,12%, ME 1103,94%, MRE 130,64%, TTP 169,4 sec for metastases; RAE 8,1%, RVE 15,1%, RLE 17,3%, ME 295,0%, MRE 98,28%, TTP 89,62 sec for FNH; RAE 5,6%, RVE 15,1%, RLE 38,8%, ME 123,4%, MRE 29,9%, TTP 181,8 sec for abscesses. Perfusion mean values calculated in malignant lesions were:
RESULTS

velocities were quantified in these lesions. All the findings were correlated with histopathology of the lesions.

METHOD AND MATERIALS

The study population comprised 100 patients (64 men and 36 women) with 43 hepatocellular carcinoma (HCC), 36 metastasis, 17 cholangiocarcinoma, and 23 hemangioma, who underwent gadoxetic acid-enhanced and BOLD MR imaging at 3 T. BOLD MR imaging was performed using a multiple fast-field echo sequence to generate 20 axial T2*-weighted images. T2* value and rate of spin dephasing (R2*) value of each tumor were calculated. On color-coded T2* map, tumors were classified into 4 categories of high signal intensity (strong, moderate, mild, rim) or isointensity, which was correlated with enhancement pattern on early dynamic phases by two observers.

RESULTS

The mean (± SD) T2* values (ms) of hemangiomas (97.3 ± 20.2) were highest, followed by HCC (48.4 ± 12.7), metastasis (37.1 ± 10.5), cholangiocarcinoma (36.6 ± 11.1) with a significant difference between hemangioma and others tumors (P < 0.0001), and between HCC and metastasis (P = 0.0002) or ICC (P = 0.0008). R2* values showed opposite trend to T2*. The agreement between T2* color map and dynamic images imaging regarding signal intensity pattern were moderate (k = 0.544) for all tumors, good (k = 0.666) for tumors > 2.0 cm, and fair (k = 0.334) for tumors of 2.0 cm or smaller. The sensitivities of BOLD MR imaging for displaying tumor hypervascularity were 75.6% and 73.2% for both observers.

CONCLUSION

Liver BOLD MR imaging at 3 T is feasible to predict hypervascularity and vascular pattern of various hepatic tumors because T2* and R2* values are different among hepatic tumors according to tumor vascularity and color map of T2* values also well reflect tumor vascularity when compared to contrast-enhanced MR imaging, particularly in hepatic tumors > 2.0 cm.

CLINICAL RELEVANCE/APPLICATION

Liver BOLD MR imaging at 3 T could be an alternative tool to gadolinium-enhanced MR imaging to predict vascularity of hepatic tumors for patients who cannot receive gadolinium-based contrast agents.

SSK06-03 • Characterization of Benign Liver Lesions with Ultrasound Quantitative Supersonic Shear Wave Elastography

Maxime Ronot MD (Presenter); Sara Di Renzo; Bettina Gregoli MD; Simon Lambert; Rafael Duran MD; Valerie Vilgrain MD

PURPOSE

To prospectively assess the stiffness of a consecutive series of benign focal liver lesions (FFL), using supersonic Shear Wave Elastography (SWE).

METHOD AND MATERIALS

Between January 2012 and March 2013, all focal liver lesions (FLL) fortuitously discovered during an ultrasound (US) examination were prospectively included. Patients with underlying chronic liver disease and malignant lesions were excluded. On all patients and for each lesion a quantitative elastography image was acquired. The largest possible region of interest was placed in the lesion to quantitatively assess its stiffness, measured in kPa. Characterization of the lesion relied either on a combination of MR imaging, CT, and contrast enhanced US features, or on biopsy. Tumor elasticity was analyzed using ANOVA and non-parametric Mann-Whitney tests.

RESULTS

112 FLL in 76 patients were analyzed. For 10 lesions (9%) in 6 patients (8%), SWE data could not be obtained due to patient motion (n=4), major steatosis (n=2) or a deep lesion (n=2). 102 lesions were successfully evaluated in 70 patients (61 women, 87%) with a mean age of 44.8 (range: 20-75). The mean stiffness was 33.3±12.7kPa for the 60 focal nodular hyperplasia (FNH), 19.7±9.8kPa for the 17 hepatocellular adenomas (HCA), 17.1±7kPa for the 20 hemangiomas, and 11.3±4.3kPa for the 5 focal fatty sparing (p = 0.0001).

CONCLUSION

SWE provides additional information for the characterization of benign FFL, and helps in differentiating FNH from HCA, and in the subtyping of HCAs.

CLINICAL RELEVANCE/APPLICATION

Quantitative elastography using SWE may help in improving the characterization of benign FFL, particularly FNHs.

SSK06-04 • Role of Acoustic Radiation Force Impulse Elastography in Characterization of Focal Solid Hepatic Lesions: Feasibility, Imaging Considerations and Preliminary Experience

Harshavardhan Nagolu MBBS (Presenter); Sudhakar Kattoju DMRD, MD; Meera Krishnakumar DMRD, MD; Chidambaramathan Natesan MD, PhD

PURPOSE

1. To analyze if solid focal liver lesions can be characterized as benign and malignant based on their appearance on ARFI Elastogram images in relation to conventional grayscale ultrasonography images. 2. To assess the accuracy of ARFI Elastometry in characterization of solid liver lesions based on differences in their shearwave velocities.

METHOD AND MATERIALS

In this prospective study, 52 patients with 60 focal solid liver lesions were single blindly analyzed on ARFI Elastogram images, which included 25 benign (21 hemangiomas, 2 abscesses, 1 adenoma and one granulomas), 27 malignant (22 HCCs, 3 adenocarcinomas of gall bladder, one fibrolamellar carcinoma and one leukemic infiltrates) and 8 metastases (3 from colonic adenocarcinoma, one each from adenoscarcinoma stomach, liver, gallbladder, rectum and transitional cell carcinoma of ureter). 30 age and sex matched controls were analyzed for normal shearwave velocity. Both qualitative and quantitative elastography were performed in these patients using Seimens ACUSON S 2000 US machine. The size and stiffness of the lesions were analyzed with respect to grayscale US images. The shearwave velocities were quantified in these lesions. All the findings were correlated with histopathology of the lesions.

RESULTS

Malignant liver lesions were found to be predominantly stiffer (88%) and larger (74%), while benign lesions were predominantly similar in stiffness to background liver (44%) or softer (40%) and were similar in size (88%). The shearwave velocities were: benign lesions 1.3±0.35 m/s, malignant lesions 2.93±0.74 m/s, metastatic lesions 2.77±0.90 m/s. Statistically significant differences exist between
CONCLUSION
ARFI elastography can be useful addition to Conventional US in improving the characterization of benign and malignant solid liver lesions. Further studies with larger population and diverse pathologies is necessary to prove its clinical implication in their characterization.

CLINICAL RELEVANCE/APPLICATION
As conventional US features are not specific in characterization of solid liver lesions, addition of ARFI elastography might help in early and accurate characterization of focal solid liver lesions.

SSK06-05 • Correlation between Size and ADC Value in Liver Metastasis

Maria Luiza Testa MD (Presenter) ; Rubens Chojniak MD, PhD ; Leticia S Sene MD

PURPOSE
To prospectively study the correlation of the size of liver metastases in the quantitative value of the apparent diffusion coefficient (ADC) obtained through DW-MRI. This technique has been studied for detection, characterization and even to assess therapeutic response, but few studies have evaluated the factors affecting the quantitative analysis of ADC and no studies have correlated the variation of the ADC with the dimensions of metastatic liver lesions.

METHOD AND MATERIALS
We analyzed 262 hepatic metastatic lesions identified in 58 adult patients who underwent upper abdominal MRI with diffusion technique. Lesions with at least 5 mm or greater in diameter were evaluated. The sequence of diffusion was performed with normal breathing, two values of b (200 and 600 sec/mm²) for detection and characterization of liver lesions. The apparent diffusion coefficient (ADC) of each lesion was obtained using the ROI (Region of Interest) positioned centrally and occupying about 50% of the lesion. Quantitative evaluation was performed by measuring the ADC value of each lesion. ADC values were correlated with the size of the lesions.

RESULTS
The average ADC of all metastatic liver lesions analyzed (n=262) was 1.1 x 10⁻³ mm²/sec [standard deviation (SD) = 0.1], [confidence interval (CI) 95%: 1.0 x 10⁻³ to 1.2 x 10⁻³ mm²/sec]. The average size of metastatic liver lesion was 19.8 mm (SD = 13.6) and a median of 16.5 mm, with a minimum of 5.0 mm and a maximum of 104.8 mm. In our study we observed that the mean ADC of metastatic liver lesions smaller than the median of 16.5 mm (n=130) was 1.6 x 10⁻³ mm²/sec ± 0.1 [CI 95%: 0.9-1.1 x 10⁻³ mm²/sec], while lesions with dimensions equal or superior than 16.5 mm (n=132), the ADC value was 1.2 x 10⁻³ mm²/sec ± 0.1 [CI 95%: 1.1-1.4 x 10⁻³ mm²/sec], with statistical significance (p < 0.05).

CONCLUSION
Larger metastatic liver lesions have higher ADC values. The increase in the size of lesions is normally associated with progression of disease, but could be paradoxically accompanied by increased the ADC value, usually associated with reduced cellularity and response to therapy.

CLINICAL RELEVANCE/APPLICATION
The ADC value increases with the size of the liver metastases. It may have an impact on the utilization of DW-MRI for lesion characterization and for monitoring of therapeutic response.

SSK06-06 • 'Extended Washout'-A New Sign for Distinguishing Hepatic Metastases from Hemangiomas on Gadoxetate Disodium-enhanced MRI

Sheela Agarwal MD, MS (Presenter) ; Seyed Mahdi Abtahi MD ; Azadeh Elmi MD ; Jason J Carroll MD ; Mukesh G Harisinghani MD ; Peter F Hahn MD, PhD *

PURPOSE
To describe the enhancement pattern of hemangiomas with gadoxetate disodium and propose a new sign—the extended washout sign—to diagnose hemangiomas on hepatobiliary phase imaging.

METHOD AND MATERIALS
In this retrospective study, quantitative and qualitative image analysis of 45 hemangiomas and 37 metastases in 77 patients was performed. Gadoxetate-enhanced MRI imaging was obtained during arterial and portal-venous phase, and delays of 3, 8, and 20 minutes. During each phase, signal intensities were measured for the lesion, liver, and aorta, and were normalized using paraspinal musculature. Quantitatively, extended washout was defined as a 10% change in signal intensity from 8 to 20 minutes. Statistical analysis was performed using paired Student's t-test. Qualitative analysis was also performed by one blinded reader, who assessed the appearance of all lesions on T2-weighted images alone, dynamic images alone, and combined early (8 min) and late (20 min) hepatobiliary phases. Extended washout was defined as a perceptible change in signal from 8 to 20 minutes. ROC analysis was used to estimate the diagnostic accuracy of the various sequences to distinguish hemangioma from metastasis.

RESULTS
On quantitative analysis, 84% of hemangiomas demonstrated a positive extended washout sign while only 18% of metastases did. Hemangiomas demonstrated a mean change in signal intensity of 18.4% as compared to 4.1% for metastases (p < 0.05). Majority of hemangiomas demonstrated a positive extended washout sign, which is not seen with most metastases. This sign, particularly when combined with T2 signal intensity, can be used to increase accuracy of differentiating hemangiomas from metastases on gadoxetate-enhanced MRI.

CLINICAL RELEVANCE/APPLICATION
Extended washout sign, particularly when used in conjunction with T2 signal intensity, can be used to increase accuracy of differentiating hemangiomas from metastases on gadoxetate-enhanced MRI.

SSK06-07 • Diagnostic Dilemma: Hepatic Angiomyolipoma versus Hepatocellular Carcinoma in Non-cirrhotic Liver on Gd-EOB-DTPA-enhanced MR

So Jung Lee (Presenter) ; So Yeon Kim MD ; Kyoung Won Kim MD ; Jin Hee Kim MD ; Yong Moon Shin ; Moon-Gyu Lee MD

PURPOSE
To describe imaging characteristics of hepatic angiomyolipoma (AML) on Gd-EOB-DTPA-enhanced MR and to identify imaging features helpful to differentiate it from hepatocellular carcinoma (HCC) in non-cirrhotic liver.

METHOD AND MATERIALS
We retrospectively identified 18 patients with pathologically proven hepatic AML who underwent Gd-EOB-DTPA-enhanced MR. We randomly chose 36 patients from 91 patients who had single HCC in non-cirrhotic liver on Gd-EOB-DTPA-enhanced MR during the same period. Two readers in consensus reviewed all the images to assess the size, the presence of fat component, enhancement profile, tumor capsule, tumoral vessels and early draining veins. For the quantitative analysis, contrast enhancement ratio (CER) and SI ratio of lesions were measured on the dynamic and hepatobiliary phases. These features and measurements were compared between the AML and HCC groups.

RESULTS
No significant difference in the size between AML (3.4 cm) and HCC (4.5 cm) (P=0.15). Intratumoral fat component was more common in AML (44.4%) than HCC (22.2%) but not statistically significant (P=0.11). Dynamic enhancement profile was similar between the two groups. In particular, arterial hypervascularity and wash-out on the portal or delayed phases were common in both HCC (97.2%) and AML (83.3%) (P=0.10). Almost all AML (100%) and HCC (94.4%) were hypointense on the hepatobiliary phase (P=0.54). However, they
differed significantly for tumor capsule on the delayed phase (no tumor capsule: AML vs. HCC, 94.4 vs. 55.5%, P=0.04), the presence of tumor vessels (44.4 vs. 8.3%, P=0.04) and early draining vein (38.8 vs. 11.1%, P=0.03). In the quantitative analysis, arterial enhancement for AML was stronger than that of HCC (CER, 140.1% vs. 89.6%, P

CONCLUSION
On Gd-EOB-DTPA-enhanced MR of non-cirrhotic liver, it is often difficult to differentiate AML from HCC, since they share similar enhancement characteristics. However, AML is more commonly without tumor capsule but contains intratumoral vessel and early draining vein. Qualitative analysis can facilitate the differentiation of AML from HCC.

CLINICAL RELEVANCE/APPLICATION
On Gd-EOB-DTPA-enhanced MR of non-cirrhotic liver, AML is often indiscernible from HCC with the enhancement characteristics alone. Capsule, tumor vessel and early draining vein may be helpful clues.

SSK06-08 • Rapidly Enhancing Hemangioma versus Hypervascular Hepatocellular Carcinoma Showing Washout Appearance on Gadoxetic Acid-enhanced Hepatic MRI: Usefulness of Diffusion-weighted Imaging for Differential Diagnosis

Sejin Nam MD (Presenter); Jeong-Sik Yu MD; Eun-Suk Cho; Jae-Joon Chung MD; Joo Hee Kim; Ki Whang Kim MD

PURPOSE
To validate the diffusion-weighted imaging (DWI) in the differential diagnosis of rapidly enhancing hemangiomas showing washout appearance on gadoxetic acid-enhanced hepatic MRI from hypervascular hepatocellular carcinomas (HCCs).

METHOD AND MATERIALS

For 54 hemangiomas (0.3 to 1.9 cm, mean 0.7 cm; in 44 consecutive patients) showing homogeneous enhancement on the arterial dominant phase images during the gadoxetic acid-enhanced dynamic MRI and showing hypointensity onlate phase imaging, DWI (b=50 and 800 s/mm2) with apparent diffusion coefficient (ADC) map were retrospectively analyzed and compared with 113 hypervascular HCCs (0.4 to 2.0 cm, mean 0.9 cm; in 66 consecutive patients) showing similar pattern of contrast enhancement. In addition to measurement of mean ADC by drawing region-of-interest in each lesion on the ADC map, qualitative analysis of DWI was performed using a five-grade scale by two independent observers.

RESULTS
Mean ADC of hemangioma was significantly larger than HCC (1.94 versus 1.00 x 10-3 mm2/s, p

CONCLUSION
For the small rapidly enhancing hemangiomas showing washout appearance during gadoxetic acid-enhanced hepatic MRI, DWI can provide a determinative information to exclude small hypervascular HCCs.

CLINICAL RELEVANCE/APPLICATION
Quantitative and qualitative analysis of diffusion-weighted imaging can provide a determinative information to characterize these atypical hemangiomas distinguished from small hepatocellular carcinoma

SSK06-09 • Delayed Enhancement of Colorectal Metastases with MR Hepatobiliary Contrast Agent

Rahul A Sheth MD (Presenter); Mukesh G Harisinghani MD; Sheela Agarwal MD, MS

PURPOSE
Hepatobiliary contrast agents provide accurate detection of hepatic metastases particularly on hepatobiliary phase owing to the high level of enhancement of the background hepatic parenchyma. Parenchymal uptake is mediated by a family of cell surface transporters known as OATPs that were previously believed to be expressed only by hepatocytes. Recently, however, the overexpression of these transporters has been demonstrated in up to 80% of colorectal cancers. The purpose of this study was to evaluate for delayed enhancement within hepatic colorectal cancer (CRC) metastases following the administration of a hepatobiliary contrast agent.

METHOD AND MATERIALS

We performed a single institution, retrospective study of all patients with pathologically proven hepatic metastases who underwent MRI with gadoxetic acid (Eovist, Bayer, NJ) between 2010-2012. Gadoxetate-enhanced MR imaging was obtained during arterial phase, portal-venous phase, and delays of 3 minutes, 8 minutes, and 20 minutes. During each phase, signal intensities were measured for the lesion, adjacent liver parenchyma, and spleen, and were normalized using signal intensity of the paraspinal musculature. Delayed enhancement was determined by calculating the percent relative enhancement between the 3 minute and 20 minute time points.

RESULTS
A total of 35 patients were identified, of which 24 (69%) had CRC metastases and 11 (31%) had non-CRC metastases including 7 AMLs, 3 HCCs, 1 sarcoma, 1 neuroendocrine tumor and 1 angiomylipoma. A total of 113 hypervascular metastases, including hyperintense on delayed phase images, were evaluated.

CONCLUSION
CRC metastases can demonstrate delayed hyperintensity with gadoxetate. This may reflect extracellular accumulation; however, given that OATP overexpression has been shown in CRC, this finding may indicate specific intracellular uptake.

CLINICAL RELEVANCE/APPLICATION
Metastases may demonstrate hyperintensity on delayed imaging with hepatobiliary agents. This should not be misinterpreted as a specific finding for a benign lesion such as focal nodular hyperplasia.

Gastrointestinal (Pancreas Benign Disease)

Wednesday, 10:30 AM - 12:00 PM • E353B
A retrospective analysis was performed on 84 patients with chronic pancreatitis (CP) and 27 normal patients as the control group. Gastroenterologists established the diagnosis of CP with Endoscopic Retrograde Cholangiopancreatography (ERCP) using the Cambridge classification. Patients were categorized as mild (n=24), moderate (n=28), severe CP (n=27) or normal. MR Cholangiopancreatography (MRCP) was performed on either 1.5T (n=68) or 3T (n=43) machines. A volume interpolated 3D GRE sequence was used to acquire pre-contrast T1-weighted images with TR of 50.0-17.1 ms and flip angle of 12 for 1.5T and TR of 4.24-0.16 ms and flip angle of 9 for 3T scanners. Two reviewers independently performed region of interest (ROI) measurements (~1cm²) from the head, body and tail of the pancreas as well as the spleen. Signal intensity ratio (SIR) of the pancreas was calculated by dividing the average pancreas signal by the spleen. Analyses of covariance (ANCOVA) models were used to compare the differences in SIR among the four patient groups, readers and magnet strength.

RESULTS
The four groups (mild/moderate/severe CP and normal) showed significant differences in SIR (p < .0001) on both 1.5 and 3T scanners. In particular, both the moderate and severe CP groups had significantly lower SIR than those in the normal group (p < .0001). The pancreas-to-muscle signal intensity (SI) ratio on unenhanced T1- and T2-weighted, dynamic contrast-enhanced, and postoperative pancreatic fistula (POPF).

CONCLUSION
Moderate and severe chronic pancreatitis patients have lower parenchymal signal on pre-contrast fat-suppressed T1-weighted GRE images.

CLINICAL RELEVANCE/APPLICATION
Decrease in the pancreas to spleen signal ratio in T1-weighted GRE images can be used as an indicator of chronic pancreatitis.

SSK07-03 • Correlation between Secretin-enhanced MRCP Findings and Histopathologic Severity of Chronic Pancreatitis in a Cat Model

Tingting Zhang (Presenter); Li Wang; Dengbin Wang MD, PhD; Zhijun Huang; Yuhua Li; Jianping Lu MD

PURPOSE
Secretin-enhanced magnetic resonance cholangiopancreatography (S-MRCP) is a noninvasive medical imaging technique that has been successfully used to evaluate pancreatic exocrine function in patients with chronic pancreatitis (CP). However, no detailed description of how S-MRCP findings relate to the severity of CP as determined by histopathology is currently available in the literature. The purpose of this study was to characterize this association in a cat model of CP.

METHOD AND MATERIALS
Thirty-two cats were divided into control (n = 8) and experimental (n = 24) groups. Cats in the experimental group underwent ligation of the pancreatic duct to induce CP, while the control group received a sham operation. MRCP was performed prior to, and 5 and 15 min after, secretin stimulation in all cats. All cats were then euthanized and pancreatic samples were processed for H&E and Sirius red staining to evaluate histopathological changes. The cats were then divided into four groups depending on the severity of CP as determined by histopathology: normal, minimal, moderate, or advanced. The S-MRCP parameters, consisting of the increasing degree of fluid volume (IDFV) at 15 min in the region of interest (which encompassed the pancreas, stomach, and small bowel) and the pancreatic duct caliber change (PDC) at 5 min, were measured and compared with the results of histopathology.

RESULTS
Significant differences were observed in both IDFV and PDC between sham-operated (control) cats and those with either moderate or advanced CP (IDFV: P = 0.001, 0.000, respectively; PDC: P = 0.013, 0.001). There were no significant differences in the two parameters between the controls and those whose CP was minimal (IDFV: P = 0.195; PDC: P = 0.964), although the minimal CP did show a downward trend.

CONCLUSION
IDFV and PDC measured with S-MRCP correlated with the histopathological severity of induced CP. S-MRCP could be used to evaluate the severity of CP, although it is somewhat insensitive for depicting very early disease.

CLINICAL RELEVANCE/APPLICATION
The assessment of exocrine pancreatic function by S-MRCP can contribute to select the appropriate medical treatment for chronic pancreatitis.

SSK07-04 • Fibrosis and Postoperative Fistula of the Pancreas: Correlation with MR Imaging Findings—Preliminary Results

Haruo Watanabe MD (Presenter); Satoshi Goshima MD, PhD; Hiroshi Kondo MD; Yoshifumi Noda MD; Masayuki Kanematsu MD

PURPOSE
To assess the potential value of magnetic resonance (MR) imaging to help assess pancreatic fibrosis and predict development of postoperative pancreatic fistula (POPF).

METHOD AND MATERIALS
This retrospective study had institutional review board approval, and the requirement for informed consent was waived. MR images obtained in 29 consecutive patients (15 men, 14 women; mean age, 64.9 years; range, 21-80 years) who underwent pancreatectomy were evaluated. The pancreas-to-muscle signal intensity (SI) ratio on unenhanced T1- and T2-weighted, dynamic contrast-enhanced, and diffusion-weighted images and the apparent diffusion coefficient (ADC) of the pancreas were measured. Degrees of pancreatic fibrosis and

Carlo Liguori (Presenter); Francesca Pitocco; Ilenia Di Giampietro; Aldo Eros De Vivo; Francesco Sorrentino; Bruno Beomonte Zobel

METHOD AND MATERIALS
In a setting of 210 TM patients we performed T2* MRI using gradient multi-echo sequences (12 echo range: 0.99-16.5 ms; slice thickness 10 mm) on pancreatic head, body and tail using three different acquisitions. Image analysis was performed using a dedicated software (CMR Tools, London, UK) and truncation method was used to account for background noise. Images were examined by two observers (obs) to assess interobserver variability and obs1 performed a double evaluation of same dataset for intraobserver variability. Each acquisition was repeated during the same exam to evaluate interstudy variability. Image quality (IQ) was assessed using a 5 point grading scale (0-very poor quality; 5-excellent quality).

RESULTS
Mean pancreatic T2* in normal subjects was 41±8.8 and significant difference (p Mean pancreatic T2* in TM value was 24.9±15.6 and significant difference (p Measurement in all three portions of the gland showed good intra-observer (p Image quality score resulted superior for pancreatic head (mean score 4.2) compared to body (3.6) and tail (2.8).

CONCLUSION
Direct assessment of pancreatic iron overload is feasible and can be considered a robust technique in terms of inter-observer and inter-study reproducibility. These data allow routine gland assessment in course of MRI performed for iron burden in TM patients.

CLINICAL RELEVANCE/APPLICATION
Despite growing interest in to endocrine evaluation in thalassemia patients, Pancreatic iron overload evaluation is still not widely adopted. Present study clarifies technical aspects in this field.

Free Breathing Dynamic Contrast MR Imaging with Navigator Technique for the Evaluation of the Pancreas

Takayuki Masui (Presenter); Motoyuki Katayama; Kimihiko Sato; Yuji Iwadate; Kazuma Terauchi; Kei Tsukamoto; Kenichi Mizuki; Masayoshi Sugimura; Hiroyuki Kasabawa; Harumi Sakahara

PURPOSE
In elderly patients who cannot hold their breaths, information of dynamic contrast study may be limited. Navigator technique can be utilized for dynamic contrast studies with repeated acquisitions. The purpose was to evaluate feasibility of dynamic contrast study during free-breathing with navigator technique for evaluation of pancreatic lesions.

METHOD AND MATERIALS
The study was approved by IRB. 48 patients (23 men, 25 women, mean 73 years old), who underwent contrast MR imaging for pancreas
at 3T between March 2011 and November 2012 were included. Pathologies were IPMN in 25 cases, other cystic in 7, solid in 2, and others in 14.

After T2WI and MRCP, with navigator technique, pre and 5 phases of dynamic contrast images (Gd-chelate 0.1mmol/kg, slice thickness 3/4mm) in axial plane were obtained using 3DFSPGR (LAVA) under free-breathing followed by imaging without navigator.

At 3T between March 2011 and November 2012 were included. Pathologies were IPMN in 25 cases, other cystic in 7, solid in 2, and others in 14. After T2WI and MRCP, with navigator technique, pre and 5 phases of dynamic contrast images (Gd-chelate 0.1mmol/kg, slice thickness 3/4mm) in axial plane were obtained using 3DFSPGR (LAVA) under free-breathing followed by imaging without navigator.

Imaging time, contrast ratio (SI on post/precontrast image) of each organ and lesions in the pancreas, sizes of lesions and number of the lesions were evaluated. Existence or absence of septa and nodules in lesions was evaluated. All evaluations were performed by two radiologists in consensus.

RESULTS
Imaging time tended to be prolonged in postcontrast phases (38-46sec). The enhancement was observed initially in the aorta followed by spleen and pancreas. All images in dynamic phases with navigator technique were diagnostic (Image quality: 4.4-4.7, Blurring: 4.3-4.7, Lesion recognition: 4.5-4.6). On images without navigator, blurring was prominent. Cystic (73 lesions in 35 cases, Fig), and solid lesions (2 lesions) were identified (mean diameter 15.5mm from 1mm to 57mm). Five lesions were missed and one serious cystic tumor was falsely recognized as solid. Septa in cysts were recognized in 31 of 45 cases. There was no nodule in cystic lesions.

CONCLUSION
With navigator technique, free breathing dynamic contrast MR imaging of the pancreas can be successfully obtained with acceptable quality and lesion recognitions. However, temporal resolution of each phase was not sufficient to evaluate solid lesions and faster imaging in combination should be considered.

CLINICAL RELEVANCE/APPLICATION

Free-breathing technique is useful for elderly patients or children, and all static and dynamic imaging can be performed with navigator.

SSK07-08 • CT Depicted Pancreatic Parenchymal Attenuation as a Potential Screening Biomarker for Predicting Glucose Intolerance and Patient Body Habitus

Surabhi Bajpai MBBS, DMRD (Presenter); Yasir Andrabi MD, MPH; Andrew P Wright MD; Debra A Gervais MD*; Dushyant V Sahani MD

PURPOSE
The purpose of this study was to investigate the correlation between pancreatic parenchymal attenuation measured on CT with patient body habitus and glucose intolerance.

METHOD AND MATERIALS
We retrospectively evaluated unenhanced abdominal CT scans performed in 120 patients (86M: 34F, mean age: 55.9 yrs, age range: 23-86 yrs) between 2008 and 2011 and found to have evidence of hepatic steatosis on CT scans. The patient cohort was categorized based on BMI (normal =24.9, overweight: 25-29.9, mild obesity: 30-34.9, moderate obesity: 35-39.9, morbid obesity: >40). The CT scans were reviewed for pancreatic parenchymal attenuation (HU), pancreatic size and thickness of perirenal fat. The CT findings were compared with review of patient medical records for presence of glucose tolerance, diabetes, degree of hepatic steatosis and body habitus.

RESULTS
Pancreatic parenchymal attenuation showed a linear decrease in HU with increase in patient body habitus (Normal: 44.2±6HU vs morbid obesity: 22±1 HU, p

CONCLUSION
Pancreatic parenchymal attenuation decreases with increasing body weight and is a predictor for occurrence of impaired glucose tolerance and occurrence of diabetes.

CLINICAL RELEVANCE/APPLICATION

Excess pancreatic fat can have negative correlation to beta cell function, leading to glucose intolerance and diabetes. Imaging can be a potential screening biomarker for detection of pancreatic fat.

SSK07-09 • Whole-organ CT Perfusion of the Pancreas: Impact of Iterative Reconstruction on Image Quality, Perfusion Parameters and Radiation Dose in 256-slice CT-pretiminary Findings

Qian Xie (Presenter); Zonghui Liang; Juan Wu; Yafang Dou; Ying Tang; Xiaoyuan Feng MD; Feijia Xu

PURPOSE
This study was to assess whether iterative reconstruction algorithm can reduce the radiation dose while maintaining acceptable image quality, and to investigate whether perfusion parameters vary from conventional filtered back projection (FBP) at the low-tube-voltage (80kVp) during whole-pancreas perfusion examination using a 256-slice CT.

METHOD AND MATERIALS
76 patients with known or suspected pancreatic mass underwent whole-pancreas perfusion by a 256-slice CT. High- and low-tube-voltage CT images were acquired. 120-kVp image data (protocol A) and 80-kVp image data (protocol B) were reconstructed with conventional FBP algorithm, and 80-kVp image data were reconstructed with iDose4 (protocol C) iterative reconstruction technique. The image noise:contrast-to-noise ratio (CNR) relative to muscle for the pancreas, liver, and aorta; and effective dose of each protocol were assessed quantitatively. Overall image quality was assessed qualitatively. Among 76 patients, 23 were eventually proven to have normal pancreas. Nine of 23 patients received 120-kVp CT perfusion scans and 14 of 23 received 80-kVp CT perfusion scans. Perfusion parameters of normal pancreas in each protocol including blood volume (BV), blood flow (BF), and permeability-surface area product (PS) were measured.

RESULTS
In the quantitative study, protocol C reduced image noise by 36.8% than protocol B (P

CONCLUSION
Low-tube-voltage and iDose4 iterative reconstruction technique can dramatically decrease radiation dose with acceptable image quality during whole-pancreas CT perfusion and have no significant impact on the perfusion parameters of normal pancreas compared to the conventional FBP reconstruction in the use of 256-slice CT scanner.

CLINICAL RELEVANCE/APPLICATION

iDose4 iterative reconstruction technique yields a significant improvement in image quality, decrease in radiation dose and appears not to impede calculation of healthy pancreas perfusion parameters.

Radiation Oncology and Radiobiology (Gastrointestinal)

Wednesday, 10:30 AM - 12:00 PM • S104A

SSK22 • AMA PRA Category 1 Credit™: 1.5 • ARRT Category A+ Credit: 1.5

Moderator
Edward Y Kim, MD

Moderator
Tarita O Thomas, MD, PhD
**ABSTRACT**

**Purpose/Objective(s):**
The purpose of this study is to assess the utility of PET in predicting pathologic complete response (pathCR) in patients treated with neoadjuvant chemoradiotherapy (chemoRT) for locally advanced esophageal cancer, and to evaluate the influence of PET response and pathCR on outcomes including disease-free (DFS) and overall survival (OS).

**Materials/Methods:**
We conducted a retrospective review of patients treated at our institution with neoadjuvant therapy and esophagectomy for T3 or N+ esophageal cancer. We collected data including the type of neoadjuvant therapy, Maximum SUV (SUVm) on PET imaging prior to and 6 weeks after neoadjuvant therapy, clinical and pathologic staging, surgical pathological findings, and overall and disease-free survival.

**Results:**
The data were collected for 25 patients, all treated with neoadjuvant chemoRT and esophagectomy. The 3-year DFS and OS were 27% and 57% respectively. The initial clinical staging was T3N0 for 9 patients (36%), cT1 in 12 (48%), and cT2 in 4 patients (16%). Pre-treatment PET had a median SUVm of 8.9 (range 4-20.5). Post-treatment PET-CT was done a median 6.1 weeks (range 3.9-6.7 weeks) after completion of RT. Post-treatment PET had median SUVm of 4.6 (range 0-9). 8 patients (40%) had a pathCR. The pathCR rates were 0% in patients with post-therapy SUVm at background levels (n=4), 50% in patients with a post-therapy SUVm 5 (n=9). When comparing post- to pre-treatment PET, 4 patients had complete response, 6 patients had >50% reduction of SUVm, and 5 had 95% pathologic response in these groups were 50%, 50%, and 40% respectively. Nodal downstaging from N+ to N0 occurred in 7 (44%) of the 16 clinically N+ patients. Patients who had a pathCR had a trend to longer median DFS compared to those who did not (2.4 vs. 0.6 years, p=0.07). Patients who had >95% pathologic response had a prolonged median survival compared to those who did not (3.6 vs. 0.6 years, p=0.001). There were no differences in 1-year DFS between patients whose post-treatment SUVm was background, less than 5, or greater than 5.

**Conclusions:**
PET-CT did not predict pathCR or DFS in our population. PathCR after chemoradiotherapy may improve DFS in patients with locally advanced esophageal cancer.

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**SSK22-04 • Early Outcomes with the Use of Intensity Modulated Radiation Therapy with Simultaneous Integrated Boost as a Part of Neoadjuvant Therapy with Concurrent Chemotherapy for Advanced Stage Rectal Cancers**

Shilpa Vyas MD (Presenter) ; Nitika Thawani MD ; Dharanipathy Rangaraj ; Niloyjyoti Deb MD ; Subhakar Mutyala MD

**ABSTRACT**

**Title:** Intensity Modulated Radiation Therapy decreases acute toxicity of neoadjuvant pelvic radiation with concurrent 5-Fluorouracil based chemotherapy for rectal cancer compared to Three Dimensional Conformal Radiation Therapies.

**Objective:** To compare the acute toxicity of neoadjuvant pelvic radiation with 5-FU based chemotherapy for rectal cancer using Intensity Modulated Radiation Therapy (IMRT) with simultaneous integrated boost (SIB) technique compared to 3D Conformal Radiation Therapy (3DCRT).

**Methods:** Forty two (42) consecutive rectal cancer patients treated with pelvic radiation and concurrent 5-FU based chemotherapy were analyzed. We compared twenty-two (21) patients treated on an institutional IMRT protocol versus twenty-eight (28) patients treated with 3DCRT. All patients received 45-50.4 Gy to the pelvis in 3DCRT group. All patients with IMRT received 45 Gy in 25 fractions to the pelvic nodes and primary rectal tumor along with a simultaneous integrated boost to a dose of 50 Gy in 25 fractions to areas of gross disease. IMRT planning was done with dose constraints for bladder, rectum, and small bowel and bone marrow. All patients in both groups received 5-FU based chemotherapy during radiation. Evaluation of toxicity was based on RTOG criteria. Two patients in the 3DCRT group and two in IMRT group received either growth factors or blood-products transfusion and needed hospitalization during treatment secondary to acute toxicities.

**Results:** All patients completed their prescribed course of radiation. Complete response rates were 5/21 (23%) in 3DCRT and 4/21 (19%) in the IMRT-SIB (p-value 0.74), 9/21 (42%) and 15/22 (71%) in the IMRT group underwent Low anterior resection according to the location of the tumor. There was no grade 4 toxicity in the IMRT-SIB group. Overall grade 2 toxicity in 3D Vs IMRT-SIB group was - GI 52% Vs 52%, GU 8% Vs 8%, Skin 42 Vs 4%, hematologic 33 Vs 47%. Overall Grade 1 toxicity in 3dCRT Vs IMRT group was- GI 33% Vs 52%, GU 23% Vs 28%, Skin 52% Vs 38%, hematologic 4% Vs 33%.

**Table:** Total Incidence of toxicity

<table>
<thead>
<tr>
<th>Grade 1 (%)</th>
<th>Grade 2 (%)</th>
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<tbody>
<tr>
<td>14 (4)</td>
<td>24 (10)</td>
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<tr>
<td>3 (14)</td>
<td>2 (9.5)</td>
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**Conclusions:** Neoadjuvant pelvic radiation with concurrent 5 FU for rectal cancer has less GI, skin and hematologic toxicity when delivered via IMRT-SIB versus 3DCRT with comparable complete response rates. Long-term follow up is needed to assess for chronic toxicity and disease outcomes.

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**SSK22-05 • Feasibility and Efficacy of Radiotherapy for Patients 80 Years Old or Older with Esophageal Cancer**

Kazuya Inoue ; Tetsuo Tamamoto (Presenter) ; Emiko Katayama MD ; Isao Asakawa ; Masatoshi Hasegawa

**ABSTRACT**

**Purpose:**
Neoadjuvant chemoradiation followed by surgery with adjuvant chemotherapy is the current standard of care for advanced rectal cancers. Target delineation during treatment planning is central to tumor control probability and to limiting normal tissue radiation toxicity especially when using conformal techniques like IMRT. Metabolically active imaging such as PET/CT is increasingly used for identification and localization of biologically viable targets. This comes with high cost, limited availability, and additional radiation exposure. Use of an air contrast enema during CT simulation for radiation treatment planning is inexpensive, readily available and potentially allows for similar targeting results without additional radiation exposure.

**Materials and Methods:**
Twelve consecutive patients with biopsy-proven rectal cancers who were treated with neo-adjuvant chemoradiation were identified who underwent PET/CT imaging in treatment planning position. CT simulation was performed with double contrast barium enema. GTV was delineated on simulation CT by 1) double contrast enema, 2) FDG activity on pretreatment PET/CT, and 3) CT portion of the PET/CT. All patients underwent PET/CT imaging in treatment planning position. CT simulation was performed with double contrast barium enema. GTV was delineated on simulation CT by 1) double contrast enema, 2) FDG activity on pretreatment PET/CT, and 3) CT portion of the PET/CT.

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**SSK22-06 • Advantages of Using Double Contrast Enema as a Low Cost Technique for Accurate Target Delineation during CT Simulation for Rectal Cancer Treated with Neoadjuvant Chemoradiation with Intensity Modulated Radiation Technique (IMRT)**

Mammen Sam MD (Presenter) ; Nitika Thawani MD ; Sameer Jhavar MD, PhD ; Karen Stumph ; Shilpa Vyas MD ; Subhakar Mutyala MD

**ABSTRACT**

**Purpose:**
Neoadjuvant chemoradiation followed by surgery with adjuvant chemotherapy is the current standard of care for advanced rectal cancers. Target delineation during treatment planning is central to tumor control probability and to limiting normal tissue radiation toxicity especially when using conformal techniques like IMRT. Metabolically active imaging such as PET/CT is increasingly used for identification and localization of biologically viable targets. This comes with high cost, limited availability, and additional radiation exposure. Use of an air contrast enema during CT simulation for radiation treatment planning is inexpensive, readily available and potentially allows for similar targeting results without additional radiation exposure.

**Materials and Methods:**
Twelve consecutive patients with biopsy-proven rectal cancers who were treated with neo-adjuvant chemoradiation were identified who underwent PET/CT imaging in treatment planning position. CT simulation was performed with double contrast barium enema. GTV was delineated on simulation CT by 1) double contrast enema, 2) FDG activity on pretreatment PET/CT, and 3) CT portion of the PET/CT.
SSK22-07 • The Use of a Neoadjuvant Hypofractionated Chemoradiation Approach for Unresectable Pancreatic Adenocarcinoma

Roberto Sabater (Presenter) ; Chance Matthiesen ; Salahuddin Ahmad PhD ; Terence Herman

ABSTRACT

Objective: Initial surgical resection is the most curative therapy approach for pancreatic cancer. Many patients are not resectable due to locally advanced tumor. For such patients, the optimal approach is unclear. Chemotherapy with and without standard fractionation radiation has been studied in multiple trials with conflicting results, and continues to be the subject of ongoing trials. We reviewed our institutional experience utilizing a neoadjuvant hypofractionated chemoradiation approach for inoperable pancreatic adenocarcinoma.

Methods: A retrospective review was performed identifying eleven patients diagnosed with adenocarcinoma of the pancreas and treated with RT from 2009-2012. Median age for the group was 65 years (range 50-80 years). Patients were deemed unresectable via radiographic (10, 90.9%) or endoscopic (1, 9.1%) criteria. Eleven were diagnosed with adenocarcinoma of the pancreatic head (8, 72.7%), body (2, 18.2%), or multicentric (1, 9.1%). Disease TNM staging included T4N0M0 (5, 45.5%), T2N0M0 (2, 18.2%), T3N0M0 (2, 18.2%), T3N0M0 (1, 9.1%), and T4N0M0 (1, 9.1%). Pretreatment PET/CT was performed in seven (63.6%) patients, with a median tumor SUV of 9.55 (range 3.8-13.7). Median pretreatment CA 19-9 was 428.7 (range 31.3-2526.1) in nine patients. Ten patients received induction chemotherapy with FOLFIRINOX (7, 70%), Gemcitabine (2, 20%), or Gemcitabine/Capcitabine (1, 10%). All patients received concurrent Capcitabine (5, 45.5%), Gemcitabine (1, 9%), or 5-FU (5, 45.5%) with radiation. Radiation therapy consisted of median treatment dose of 49.5 Gy in 18 fractions via IMRT (range 49.5 - 60 Gy in 18-30 fractions). Goals of neoadjuvant therapy in all patients were to achieve an R0 resection following therapy completion.

Results: All patients completed RT without complications or treatment interruption. Median follow up after RT was 6 months (range 0-21). Eight (72.7%) patients had post-RT PET/CT. Results showed four lesions with a complete resolution of hypermetabolic activity, and four lesions decreased to a median SUV of 4.4 (range 2.7-5.4). Median post-RT CA 19-9 nadir was 51 (range 0-2393.1). Five patients (45.5%) proceeded to surgical resection. All achieved a R0 resection. Pathologic staging was ypT3N1 (1, 20%), ypT1N0 (2, 40%), ypT1N0 (minimal residual disease) (1, 20%), and no residual disease (1, 20%). One (20%) patient died of surgical complications; the other four (80%) remain disease free. Six patients (54.5%) remained inoperable at completion radiotherapy. At the time of review, seven (63.6%) patients remain alive, three (27.3%) are deceased, and one (9.1%) was lost to follow up.

Conclusion: Hypofractionated chemoradiation is a well-tolerated treatment approach for unresectable pancreatic cancer. This approach can achieve resectability in some patients.

Further investigation is warranted.

SSK22-08 • Adjuvant Chemoradiotherapy for Resected Hepatocellular Carcinoma

Atto O Wright MD (Presenter)

ABSTRACT

PURPOSE: Curative surgical approaches for hepatocellular carcinoma (HCC) include partial hepatectomy (PH) and liver transplantation. In other malignancy subsites, data demonstrate a benefit of adjuvant therapy for close or positive margins and/or nodal positivity; it may be reasonable to extrapolate these oncologic principles to the management HCC. The purpose of this study is to evaluate the outcomes and toxicity in patients with HCC treated with PH followed by adjuvant radiation therapy (RT). To our knowledge, this is the first study to evaluate the role of adjuvant RT for HCC.

METHOD: This study includes patients who underwent PH and adjuvant RT at our institution between 2001 and 2012. HCC was defined radiographically (10, 90%), or endoscopically (1, 10%). Delineation of the gross tumor volume (GTV) was performed on pretreatment PET/CT as well as on the CT portion of the PET/CT. Final target volume (CTV) was delineated on simulation CT by 1) double contrast enema, 2) FDG activity on pretreatment PET/CT, and 3) CT portion of the PET/CT.

RESULTS: Six patients were identified who met inclusion criteria. All patients were locally advanced, with stage III-IVA disease, based on AJCC 7th edition. Preoperative Childs-Pugh grade was class A for five patients and class B for one patient. Preoperative alpha fetoprotein (AFP) level was less than 2000ng/mL for 5 patients and unknown for one patient. The median AFP level for the 5 patients was 3.5ng/mL. The resection margins ranged from 0 mm to 8 mm, with a median margin of 4 mm. Tumors from 4 patients demonstrated vascular invasion, one was negative for vascular invasion and unknown for one. Five of 6 patients had lymph node sampling with 3 having involved nodes. The median radiation dose was 45 Gy in 1.8 Gy fractions. Five patients received concurrent Capecitabine (5, 45.5%), Gemcitabine (1, 9%), or 5-FU (5, 45.5%) with radiation. Radiation therapy consisted of median treatment dose of 49.5 Gy in 18 fractions via IMRT (range 49.5 - 60 Gy in 18-30 fractions). Goals of adjuvant therapy in all patients were to achieve an R0 resection following therapy completion.

RESULTS: All patients completed RT without complications or treatment interruption. Median follow up after RT was 6 months (range 0-21). Eight (72.7%) patients had post-RT PET/CT. Results showed four lesions with a complete resolution of hypermetabolic activity, and four lesions decreased to a median SUV of 4.4 (range 2.7-5.4). Median post-RT CA 19-9 nadir was 51 (range 0-2393.1). Five patients (45.5%) proceeded to surgical resection. All achieved a R0 resection. Pathologic staging was ypT3N1 (1, 20%), ypT1N0 (2, 40%), ypT1N0 (minimal residual disease) (1, 20%), and no residual disease (1, 20%). One (20%) patient died of surgical complications; the other four (80%) remain disease free. Six patients (54.5%) remained inoperable at completion radiotherapy. At the time of review, seven (63.6%) patients remain alive, three (27.3%) are deceased, and one (9.1%) was lost to follow up.

Conclusion: Hypofractionated chemoradiation is a well-tolerated treatment approach for unresectable pancreatic cancer. This approach can achieve resectability in some patients.

Further investigation is warranted.
METHOD AND MATERIALS
Retrievable expandable metallic stents were placed under fluoroscopic guidance in 444 patients with symptomatic esophageal stricture. We retrospectively reviewed collected patient records to evaluate the incidence and interventional management of stent migration. Multivariate analysis was performed to evaluate prognostic factors of stent migration. Stent migrations were classified into four patterns on the basis of the location of migrated stent.

RESULTS
Stent migration occurred in 50 (11.3%) of 444 patients 1 ± 228 days (mean, 42 days) after stent placement. Multivariate analysis revealed that young patients (odds ratio [OR], 1.026; P = 0.036), grade 2; able to tolerate soft food without vomiting before the procedure (OR, 5.989; P = 0.001), and benign stricture (OR, 3.044; P = 0.017) were independent prognostic factors of stent migration. 39 (78%) of 50 patients with stent migration were required second interventional management. The remaining 11 patients showed improvement of the strictures until the end of the follow-up.

CONCLUSION
The overall incidence of stent migration was 11.3%. Stent migration occurs most commonly in young age, capability to tolerate soft food without vomiting before the procedure, and in patients with benign stricture. Stent migration can be successfully managed by additional intervention.

CLINICAL RELEVANCE/APPLICATION
Patients with capability to tolerate soft food without vomiting before the procedure were considered contra-indication for esophageal stent placement.

SSK24-02 • Metallic Stent Placement in Patients with Recurrent Malignant Obstruction in Surgically Altered Stomach

Soo Hwan Kim (Presenter); Ho-Young Song MD; Jin Hyoung Kim MD; Jung-Hoon Park RT; Young Chul Cho BS; Ki Back Lee

PURPOSE
To assess the technical feasibility and clinical effectiveness of expandable metallic stent placement in 196 patients for recurrent malignant obstruction in surgically altered stomach.

METHOD AND MATERIALS
The 196 patients were treated with five different types of gastric surgery for gastric cancer: total gastrectomy (type 1) in 72 patients, distal gastrectomy with gastroduodenostomy (type 2), in 39 patients, distal gastrectomy with a Roux-en-Y gastrojejunostomy (type 3) in 21 patients, distal gastrectomy with a gastrojejunostomy (ie, Billroth type II operation) (type 4) in 49 patients, palliative gastrojejunostomy for unresectable gastric cancer (type 5) in 14 patients. Technical and clinical success, complications, and dysphagia score were evaluated and complications compared between fully covered stent and partially covered stent. Overall survival and stent patency rates were calculated according to the Kaplan-Meier method.

RESULTS
Stent placement was technically successful in 192 of 196 patients (97.9%) with 184 of 192 patients (95.8%) showing symptomatic improvement. In four patients, the guide wire could not pass through the stricture. The mean dysphagia score improved from 3.24 ± 0.64 to 1.48 ± 0.82 (P < 0.001). The complication rate was 25%. Incidence of stent migration was significantly greater in fully covered stents than partially covered stents (P < 0.001). The median survival and stent patency were 127 and 41 days, respectively.

CONCLUSION
Placement of expandable metallic stents in patients with recurrent cancer after surgically altered stomach technically feasible and clinically effective.

CLINICAL RELEVANCE/APPLICATION
Accurate knowledge of the type of surgical procedure performed and determination of the pattern of tumor recurrence are important for successful stent placement.

SSK24-03 • The Use of Colorectal Stents to Avoid the Need for a Stoma When Treating Colorectal Cancer

Victoria H Wilkinson MBChB, FRCR; James N Hampton MBBS; Rina George MRCS; Junaid Saeed MBBS, MRCS (Presenter)

PURPOSE
To ascertain the rate of stoma avoidance in patients having a colorectal stent inserted as a bridge to surgical resection of their colorectal cancer.

METHOD AND MATERIALS
The records of patients who had had a colorectal stent for large bowel obstruction between December 2007 and February 2012 in Sheffield Teaching Hospitals were retrospectively analysed.

RESULTS
121 colorectal stents were placed over a 4.5 year period. 19 patients had the procedure as a bridge to surgical resection of their colorectal cancer. 2 patients had a clinically unsuccessful stent and required subsequent Hartmann’s procedures. 11 patients had a primary anastomosis, of whom 2 had a stoma formed subsequently due to complications. Thus 9 of the 19 patients (47%) avoided a stoma at any point.

CONCLUSION
Only a minority of the colorectal stents placed in Sheffield are as a bridge to surgical resection of colorectal cancers with the majority being a palliative procedure. The use of stenting prevents some patients with surgically treatable disease needing a stoma. A significant number however still require stoma formation due to a failed stent or patient or surgical factors which prevent a primary anastomosis.

CLINICAL RELEVANCE/APPLICATION
Colorectal stenting as a bridge to surgical resection of a tumour can be used to avoid the morbidity associated with a stoma.

SSK24-04 • Primary Mushroom-cage Radiologically Inserted Gastrostomy (RIG) without need for Conscious Sedation: 10-year Single Centre, Single Operator Experience in 206 Patients

Stephen Gregory MBBS (Presenter); Ounali Jaffer MBBS, FRCR; Dylan Lewis MBBCh, FRCR; Thoraya Ammar; Paul S Sidhu MRCP, FRCP *

PURPOSE
To retrospectively review experience in primary insertion of the skin-level mushroom cage gastrostomy tube (Entristar TM, Covidien, MA, USA); under radiological guidance.

METHOD AND MATERIALS
Over a 10-year period (2002 to 2012), patients who underwent a primary RIG procedure by a single operator utilizing 4 gastropexy sutures, under local anaesthetic without conscious sedation were reviewed for procedural complications (minor or major), 30-day mortality and tube longevity. Indications for RIG were noted. Radiological reports, PACS images, biochemical and hematological parameters, clinical notes and discharge summaries were reviewed.

RESULTS
CONCLUSION
Our large number, single centre, single operator experience suggests that primary placement of this durable gastrostomy tube is safe with acceptable complication rates and no procedure related deaths in this cohort of 206 patients.

CLINICAL RELEVANCE/APPLICATION
Primary insertion of gastrostomy tubes of the mushroom-cage type is safe and should be considered in all patients requiring RIG as a means for long term nutrition. Tube longevity is unmatched.

SSK24-05 • Parietal Contrast Enhancement as a Sign of Giant Cell Arteritis and as an Inflammatory Marker
Jose Gutierrez MD; Pedro Arguis MD (Presenter); Marcelo Sanchez MD; Daniel Barnes; Sergio Prieto; Maria C Cid; Ana I Garcia MD

PURPOSE
1. To evaluate the parietal contrast enhancement of the aorta as a sign of Giant Cell Arteritis (GCA), in recently diagnosed patients
2. To determine the relevance of parietal contrast enhancement as an inflammatory marker

METHOD AND MATERIALS
1. CT-angiography (CTA) was performed in 16 newly diagnosed biopsy-proven GCA patients
2. All patients had an evaluable CTA with arterial and venous phases
3. We defined significant enhancement as an increase of 20 UH or more, between the arterial and venous phases
4. 16 patients without evidence of arteritis were used as the control group. They were chosen for having similar clinical characteristics, and an equivalent burden of aortic calcifications, for each patient with GCA
5. A CTA was performed one year later
6. Levels of erythrocyte sedimentation rate (ESR) before the first CTA and a year later were tested

RESULTS
1. All patients (100%) presented high levels of ESR at the moment of diagnosis and normal levels in follow up testing one year later
2. 15 of 16 patients (93.75%) presented enhancement. None of the normal controls showed enhancement
3. 11 of 15 patients (73.3%) presented absence of enhancement In the CTA acquired a year later. 3 of 15 (20%) were classified as non-evaluable (because the arterial wall had less than 2 millimeters), and only 1 (6.66%) of them were enhanced

CONCLUSION
1. Parietal enhancement of the aorta is an excellent sign in non-treated GCA, and could be considered a diagnostic criterion, especially in patients with doubtful parietal thickening
2. Parietal enhancement is useful as an inflammatory marker, as absence of enhancement in most of treated patients on CTA performed one year later (with normal ESR values) was observed, despite the fact that 11 of them still presented parietal thickening

CLINICAL RELEVANCE/APPLICATION
Parietal enhancement could detect inflammation before the systemic markers, distinguish inflammatory thickening from parietal fibrosis, and determine important therapeutic decisions

SSK24-06 • Technical Working Group Postmortem Angiography Methods (TWGPAM): Preliminary Results of a Multicenter Study for Validating Post-mortem Computed Tomography Angiography
Silke Grabherr (Presenter); Jochen M Grimm MD; Axel Heinemann; Giuseppe Guglielmi MD; Krzysztof Wozniak; Franziska Eplinius; Fabrice Dedouit; Florian Fischer MD; Guy N Rutty; Bruno Morgan MD; Holger Wittig; Patrice Mangin MD, PhD; Richard Dirnhofer

PURPOSE
Post-mortem CT-angiography is an exam that aims to increase the sensitivity of post-mortem radiology. However, until today all applied autopsy has been published. There is a need to define a standardized method and technical equipment in order to transform postmortem CT-angiography into a routine examination. With this aim, an international working group called TWGPAM (Technical Working Group Postmortem Angiography Methods) has been created in spring 2012. It consists of nine participating centers in six European countries. The goal of this prospective international multi-center study is to validate the technique, define its conditions and evaluate its advantages and limitations.

METHOD AND MATERIALS
In 2013, a study comparing findings of the recently developed Multi-phase Postmortem CT-Angiography (MPMCTA) with conventional autopsy has been published by our research group. Based on results of this study, the multicenter study was initiated. Each center performed MPMCTA on their cases using the standardized study protocol. 500 cases of medico-legal and clinical autopsies will be included. Data collection is performed by a team of one radiologist and two forensic pathologists (one to extract data from autopsy reports and one to review the radiological data with the radiologist). All findings are entered into a common data base for analysis.

RESULTS
Nearly all findings were visualized with both techniques. However, some findings can better or exclusively be visualized with one of them. MPMCTA has a higher sensitivity for identifying skeletal and vascular lesions. However, conventional autopsy gives more information about organ morphology and remains the only way to diagnose a vital vascular occlusion with certitude. Preliminary results of the ongoing study confirm these results.

CONCLUSION
MPMCTA can reveal important findings, not visible at conventional autopsy. However, some diagnoses remain autopsy-diagnoses. The multi-center study confirms these results and will enable the new technique to be accepted in the medico-legal community.

CLINICAL RELEVANCE/APPLICATION
Post-mortem CT angiography is a new technique allowing the diagnosis and visualisation of vascular findings. This study enables the new method to become a routine investigation.

SSK24-07 • Utilization and Results of Adrenal Mass Biopsy in the PET/CT Era: 10-year Retrospective Analysis
Ari C Sacks MD (Presenter); Nisha Sainani MD; Cheryl A Sadow MD; Robert W Gordon MD; Edmund Cibas MD *; Stuart G Silverman MD *

PURPOSE
To evaluate indications for and results of percutaneous image-guided adrenal mass biopsy in the era of FDG-PET/CT.

METHOD AND MATERIALS
RESULTS
Ninety-four percutaneous adrenal mass biopsies were included in 92 patients (53 males, 39 females), average age 66.2 years (range 37-85). When comparing before (n=22) and after (n=72) January 2004, there was statistically significant difference in the number of pre-biopsy PET/CT scans 22.7% (n=5) vs. 65.3% (n=47) (p

CONCLUSION
Increasing use of PET/CT in the workup for malignancies has resulted in increase in number of adrenal mass biopsy being performed based on PET/CT referral, with change in indication from evaluation of an indeterminate adrenal mass to confirmation of malignancy.
**SSK24-08 • Adequate Biopsy Sampling in the Molecular Treatment Era: Factors Predicting Successful Cancer Sampling for Genetic Tests**

Mikhail Silk BS (Presenter); Jeremy C Durack MD; Natasha Rekhtman MD; Cyrus Hedvat MD; Joseph P Erinjeri MD, PhD; Stephen B Solomon MD *

**PURPOSE**
To determine the procedural factors that influence the success rate for biopsies taken for cancer genetic testing.

**METHOD AND MATERIALS**
We retrospectively reviewed all percutaneous image-guided needle biopsies taken for genetic testing by the interventional radiology department from January 2002 to March 2013 at a single institution. The number of biopsy reports deemed diagnostic by rapid touch preparation cytology and reported as insufficient for genetic testing were reviewed for reason for failure and biopsy type (FNA vs. Core).

**RESULTS**
The Interventional Radiology Department conducted 2417 biopsies [1536 (64%) core + FNA, 572 (24%) FNA only, 254 (11%) core only, and 55 (2%) unidentified in reports] for genetic testing during the observation period. In this cohort 248 (10%) deemed diagnostic by rapid touch preparation cytologic review at the time of biopsy did not contain sufficient tissue for genetic testing. Of the 248, 166 (67%) by slide review contained too few tumor cells to advance to testing and 82 (33%) were test failures due to inadequate DNA. Of the 166 determined by the pathologist as insufficient to advance for genetic testing, 89 (54%) had a core + FNA sample taken, 56 (34%) were FNA only, 18 (11%) were core only and 3 (2%) were unidentified in reports. Of the 82 failures that advanced to genetic testing 47 (57%) had a core + FNA sample taken, 16 (20%) were FNA only, 11 (13%) were core only, and 8 (10%) were unidentified in reports.

**CONCLUSION**
Genetic testing is an increasingly important aspect of cancer biopsies. Insufficient DNA quantity or poor DNA quality are relatively common reasons for genetic testing failure. We found that when genetic testing is planned, biopsies without a core component were more likely to be insufficient than those that did. Improved systems for rapid assessment of DNA quantity at the time of biopsies may improve the rate of adequate sampling for genetic testing.

**CLINICAL RELEVANCE/APPLICATION**
When genetic testing is planned adding a core biopsy has a higher chance of being adequate and reduces the need for repeat sampling due to inadequate tumor tissue.

**SSK24-09 • 3D-Evaluation of Tumor Necrosis in HCC Patients after TACE - A Radiologic-Pathologic Correlation**

Julius Chapico MD (Presenter); Laura Wood MD; Mingde Lin PhD *; Toby Charles Cornish MD, PhD; Vania Tacher MD; Jean-Francois H Geschwind MD *

**PURPOSE**
To evaluate the precision of a three-dimensional (3D) HCC tumor necrosis assessment using quantitative EASL (qEASL) and volumetric RECIST (vRECIST), we correlate radiologic and pathologic findings in patients with HCC, who underwent tumor resection (TR) or liver transplantation (LT) after TACE.

**METHOD AND MATERIALS**
This retrospective study included 17 patients with HCC, who underwent TACE and received contrast-enhanced MR (CE-MRI) imaging within 90 days prior to TR or LT. A semiautomatic 3D volumetric segmentation and tumor volume measurement was performed on the last CE-MRI scans before TR/LT. The total tumor volume was expressed as vRECIST. The volume of enhancing tumor was measured using qEASL as a percentage of the total tumor volume. The tumor necrosis was thus defined as 1 - qEASL%. The treated lesions were evaluated by histopathologic analysis of the resected tumors and correlation with hematoxylin and eosin staining. Correlation coefficients were calculated to compare the percentage of necrosis shown on pathology with the percentage of necrosis calculated with qEASL.

**RESULTS**
The mean interval between latest MRI and LT/TR was 42.5 +/− 40.5 days. The mean interval between latest TACE and LT/TR was 128 +/− 94 days. A total of 9 patients (52.94%) received DEB-TACE, 8 patients (47.06%) received conventional TACE treatment. 6 patients (35.3%) underwent TR and 11 patients (64.7%) received a LT. The mean tumor necrosis on qEASL was 76.94% (Range 37.61–99.91%) and correlated with statistical significance with the tumor necrosis on pathology, with an R-value of 0.93 (95% confidence interval (CI), 0.7678-1.034; p = 0.00001).

**CONCLUSION**
This study shows a high precision of the 3D semiautomatic tumor segmentation software and qEASL assessment in measuring HCC tumor necrosis after TACE, which strongly correlates with gross and histopathology (the gold standard in tumor response assessment). Thus, qEASL can be a valuable imaging-based tool to measure tumor response.

**CLINICAL RELEVANCE/APPLICATION**
The close radiologic-pathologic correlation of qEASL necrosis assessment validates this 3D tool for a standardized clinical use. Thus, qEASL has the potential to complement existing response criteria.
Migration of the Appendix in Pregnancy

Ashkon Senaati MD (Presenter); Amar M Amin MD; Dan G Gridley MD; Maria Manriquez MD

PURPOSE
Acute appendicitis is a common troublesome problem in pregnancy. In today’s tertiary care centers the diagnosis of appendicitis is limited in the pregnant patient. Therefore, the diagnosis is commonly left to the clinical judgment of those performing the physical exam. There is controversy in the literature over the superior migration of the appendix during pregnancy. Thus, we proposed a retrospective cohort study that looks solely at the displacement of the appendix, as it relates to gestational age in trauma patients who received a CT (computed tomography) scan without evidence of appendicitis. Our hypothesis was that there is no change in appendix location with gestational age.

METHOD AND MATERIALS
A retrospective analysis of pregnant females presenting to Maricopa Medical Center for trauma was performed. 191 of these patients received CT scans of the abdomen and pelvis as part of their workup. Of these, 80 were analyzed. Study participants were of all ages, gestational ages from 14 to greater than 40 weeks. Exclusion criteria included those with major non-obstetrical abdominal surgery. The left iliac crest and umbilicus were used as anatomic landmarks to describe the location of the appendix. We used statistical analysis to find a correlation between the appendiceal location with the gestational age, trimester and body mass index.

RESULTS
Using both a Pearson’s Correlation and a Levene T-test, we found a statistically significant difference in appendiceal location relative to the left iliac with both gestational age and trimester in the craniao-caudal dimension but not the transverse dimension. Statistically significant difference was also found when comparing the appendiceal location with trimester in the AP dimension.

CONCLUSION
Our study demonstrates a significant difference in the mobility of the appendix in the transverse and AP dimensions. This may be of value when using the physical exam to assess the pregnant patient for signs of acute appendicitis.

CLINICAL RELEVANCE/APPLICATION
Our study aims to aid in the evaluation of the diagnosis of acute appendicitis in the pregnant patient.

**LL-GIS-WE2A • CT Findings of Transient Decreased Attenuation Areas in the Distal Pancreatic Parenchyma with Obstructive Pancreatitis; Evaluation by Dynamic Helical CT**

**Koji Takeshita** MD (Presenter) ; **Shigeru Furui** MD

**PURPOSE**
Obstructive pancreatitis is caused by obstructions or stenosis of the main pancreatic duct (MPD), and in some cases, obstructive pancreatitis may indicate pancreatic cancer. The purpose of this study is to evaluate the characteristic enhancement pattern in obstructive pancreatitis.

**METHOD AND MATERIALS**
We selected 335 patients with dilatation of the MPD by more than 2 mm on ultrasonography and performed non-enhanced and three-phase contrast enhanced CT scans of the pancreas. The attenuation of pancreatic parenchyma, proximal and distal to the site of the MPD stenosis or obstruction, was measured and the differences were calculated from proximal attenuation (PA) minus distal attenuation (DA) (PA-DA (HU)). Decreased attenuation in the distal pancreatic parenchyma (DADP) was defined positive when the PA-DA was more than 30HU. The cases positive for DADP (n=12) were investigated further. The tumor size, the maximum diameter of the MPD, stenosis or obstruction of the MPD were determined, and atrophic changes in the pancreatic parenchyma were also evaluated in the cases with DADP.

**RESULTS**
The cases positive for DADP were seen in 12 patients (3.6 %) during the arterial-phase. DADP was not seen on non-enhanced, or enhanced pancreatic and delayed-phase imaging. Mean values of PA-DA in 12 patients were 50.5±6.7 HU, and these patients were diagnosed as pancreatic cancer. In cases with DADP, the tumor diameters ranged from 15 mm to 28 mm (mean 19.9±5.0 mm), and were statistically smaller than in cases with pancreatic cancer without DADP (mean tumor diameter 38.2±8.0 mm). Two cases were stage 1, and the others were stage 3. Focal stenosis or obstruction of the MPD with dilatation of the distal MPD was demonstrated in all patients (mean MPD diameter 5.8±1.3mm). Evidence of atrophic change in the distal pancreatic parenchyma was demonstrated in 4 patients.

**CONCLUSION**
Transient DADP may reflect decreased pancreatic microvascular blood flow associated with high pancreatic interstitial pressure derived from obstructive pancreatitis. The findings may be a clue to diagnosis in the early stages of pancreatic cancer with obstructive pancreatitis.

**CLINICAL RELEVANCE/APPLICATION**
The findings of transient DADP on arterial phase in obstructive pancreatitis may be a clue in the diagnosis of pancreatic cancer at the early stages.

**LL-GIS-WE3A • Quantitative Analysis the Features of Benign and Malignant Gastric Mucosal Lesions: The Initial Experience of Spectral CT**

**Cheng Ni** MD (Presenter) ; **Biyong Tan** MD ; **Daoyu Hu** MD, PhD ; **Zhen Li** MD, PhD ; **Baseng Li** ; **Xiaoyan Meng** MD ; **Yao Hu MD**

**PURPOSE**
To investigate the quantitative analysis value of spectral computed tomography (CT) in differentiating benign and malignant mucosal lesions.

**METHOD AND MATERIALS**
64 patients with gastric cancer (GC), 48 patients with gastric inflammation (GI) and 50 patients with normal gastric mucosa (NG) were retrospectively studied in cohort. All the patients underwent double phase (arterial phase, AP and portal venous phase, PVP) enhancement spectral CT performed. The mean iodine concentrations (ICs, mg/ml) of GC, GI, NG, benign gastric mucosa (BG, including GI and NG) and gastric mucosal disorders (GD, including GC and GI) were calculated. An independent sample t test was performed to compare mean ICs between these groups. Diagnostic performance was evaluated by receiver operating characteristic (ROC) curve analysis.

**RESULTS**
Spectral CT quantitative analysis appears to be useful in characterizing malignant gastric mucosal lesions, and might help increase the sensitivity and specificity of gastric mucosal lesions detection.

**CONCLUSION**
Spectral CT quantitative analysis appears to be useful in characterizing and detecting gastric mucosal lesions.

**CLINICAL RELEVANCE/APPLICATION**
Spectral CT quantitative analysis appears to be useful in characterizing malignant gastric mucosal lesions, and might help increase the sensitivity and specificity of gastric mucosal lesions detection.

**LL-GIS-WE4A • Evaluation of Fibrotic Liver Disease by Whole-liver T1-rho MR Imaging: A Feasibility Study in Humans at 1.5T**

**Thomas Allkemper** MD (Presenter) ; **Florian Sagmeister** MD ; **Vito Cincinnati** MD ; **Susanne Beckebaum** MD ; **Hendrik Kooijman** * ; **Christian Kanthak** * ; **Christoph Stehling** MD ; **Walter L Heindel** MD

**PURPOSE**
To investigate the feasibility of whole-liver T1-rho magnetic resonance imaging (MRI) in patients with fibrotic liver disease at 1.5T.

**METHOD AND MATERIALS**
The study was approved by the institutional ethics committee (#2012-428-f-S). All subjects provided written informed consent. Healthy volunteers (n=20) and patients (n=18) with cirrhosis (Child-Pugh A to C) underwent whole-liver T1-rho MRI at 1.5 T using spin-lock times (SLT) of 10, 20, 40, and 80 ms. Mean T1-rho value and standard deviation were calculated from ROIs depicting liver parenchyma (n=40-60 ROIs per liver) and regarded as the characteristic T1-rho value of each subject. T1-rho values of volunteers and patients were analyzed by one-way analysis of variance and appropriate post-hoc tests. Pearson’s correlation coefficient was used to test for correlation between T1-rho, age and gender in all subjects.

**RESULTS**
T1-rho values of volunteers and patients were significantly different (F(3,34)=26.45, p In all subjects, T1-rho did not correlate with age or gender.

**CONCLUSION**
Whole-liver T1-rho MRI at 1.5 T to detect and assess human liver cirrhosis is feasible. Further investigation and optimization of this technique is warranted to cover the entire spectrum of fibrotic liver disease.

**CLINICAL RELEVANCE/APPLICATION**
When using different CM administration techniques, perfusion measurement is most robust in the liver. MS was the most robust method.

**CONCLUSION**

**RESULTS**

The values were compared among the groups.

**METHOD AND MATERIALS**

An IRB approved retrospective image analysis of 72 patients with pancreatic cysts was performed. Forty-four of these were pathologically proven cystic neoplasms and 28 patients were pseudocysts. Pseudocysts were designated as non-neoplastic group and found in patients with recent history of pancreaticitis, without acute imaging findings and were confirmed either surgically or by spontaneous regression on follow-up studies. The cystic neoplasms included; 17 side branch type intra-ductal papillary mucinous neoplasms (IPMN), 13 mucinous cystic neoplasms (MCN) and 14 serous cystic neoplasms (SCN). Two experienced abdominal radiologists blindly reviewed the images.

**RESULTS**

There was substantial inter-observer agreement between the readers (kappa coefficient: 0.65). Sensitivity, specificity, false positive and false negative rates of MRI for diagnosis of all cystic neoplasms was 95%, 56%, 44% and 4.5%, respectively. When each neoplasm was individually analyzed, sensitivity and specificity for IPMN was 94% and 87%, for MCN 75% and 91%, for SCN 89% and 95%. Readers felt the high-spatial-resolution MR images not only detect the communication of the side-branch IPMNs with the main pancreatic duct in 97% of the cases on both thick slab MRCP and 3D-MRCP. IPMNs had average size of 2.5 cm, lobulated contours, mostly located in the head but were multifocal in half of the cases. MCNs were the largest cystic lesions with average size of 5.5 cm, 40% showed internal debris and 85% had a visible capsule. Because of these features, MCNs were misdiagnosed as pseudocysts in 30% of the cases. Pseudocysts demonstrated debris in 64% and a capsule in 74% of the cases. SCNs were mostly solitary cyst, located in the tail, and lobulated. Enhancing septations were seen (71%) of SCNs, as a distinguishing feature.

**CONCLUSION**

MRI with MRCP has 89% sensitivity and 67% specificity for diagnosis of cystic neoplasms. Due to overlapping imaging features, inter-observer agreement is not very high. However, MRCP has a very high sensitivity for differentiating side-branch IPMN from other pancreatic cysts such as MCNs which carries a higher malignant potential. Making this distinction can be very helpful in the management of the cystic neoplasms.

**CLINICAL RELEVANCE/APPLICATION**

MRI with MRCP is a very useful diagnostic tool for evaluation of pancreatic cystic neoplasms.

**LL-GIS-WEGA • Ultra-high-Field (7.0-T) MR Imaging of Esophageal Carcinoma Ex Vivo: Correlation of High-spatial-Resolution MR Images and Histopathologic Findings**

**Ichiro Yamada** MD (Presenter); **Naoyuki Miyasaka** MD; **Keigo Hikishima** PhD, MS; **Yutaka Tokairin** MD; **Tatsuyuki Kawano** MD; **Eisaku Ito** MD; **Daisuke Kobayashi** MD; **Yoshinobu Eishi** MD; **Hideyuki Okano** MD, PhD; **Hitoshi Shibuya** MD

**PURPOSE**

To determine the usefulness of high-spatial-resolution MR imaging at ultra-high field strength (7.0 T) for evaluating the depth of mural invasion by esophageal carcinomas.

**METHOD AND MATERIALS**

Twenty esophageal specimens each containing a carcinoma were studied using a 7.0-T MR system with a four-channel phased-array surface coil. High-spatial-resolution T2-weighted MR images were acquired by using a fast spin-echo sequence with the following parameters: repetition time, 3000 msec; effective echo time, 80 msec; rapid acquisition with relaxation enhancement factor, 4; and number of excitations, 32. High-spatial-resolution T1-weighted MR images were also acquired. All the images were obtained with a field of view of 50-60 x 25-30 mm, matrix of 512 x 256, and section thickness of 1.0 mm, which resulted in a voxel size of 0.098-0.12 x 0.098-0.12 x 1.0 mm = 0.0095-0.014 mm3. MR images were compared with the histopathologic findings as the gold standard.

**RESULTS**

High-spatial-resolution T2-weighted images at 7.0 T clearly depicted the normal esophageal wall in all 20 specimens (100%) as consisting of the following eight layers: epithelium (low signal intensity (SI)), lamina propria mucosae (high SI), muscularis mucosae (low SI), submucosa (high SI), inner circular muscle (low SI), intermuscular connective tissue (high SI), outer longitudinal muscle (low SI), and adventitia (high SI). These eight layers were found to clearly correspond to the individual tissue layers of the normal esophageal wall. In all 20 esophageal carcinomas (100%), high-spatial-resolution MR images were capable of determining the depth of tumor invasion of the esophageal wall that was confirmed by histopathologic examination. High-spatial-resolution MR images were also capable of differentiating tumor from fibrosis and visualizing tumor growth patterns and adjacent lymph node involvement.

**CONCLUSION**

High-spatial-resolution 7.0-T MR imaging is capable of clearly depicting the individual tissue layers of the normal esophageal wall, and it has excellent diagnostic accuracy for evaluating the mural invasion of esophageal carcinomas. Thus, high-spatial-resolution 7.0-T MR imaging may make it possible to noninvasively diagnose the depth of mural invasion by esophageal carcinomas.

**CLINICAL RELEVANCE/APPLICATION**

By using high-spatial-resolution MR imaging at 7.0 T, we may have a new tool to noninvasively diagnose the depth of mural invasion by esophageal carcinomas.

**LL-GIS-WE7A • Optimization of Contrast Medium Administration in CT Perfusion in the Abdomen**

**Tomonori Kanda**; Takeshi Yoshikawa MD *; Keitaro Sofue (Presenter); Yoshiharu Ohno MD, PhD *; Yasuko Fujiyawa MS *; Tohru Murakami; Mizuho Nishio MD *; Hisanobu Koyama MD; Naoki Kanata MD; Noriyuki Negi RT; Kazuro Sugimura MD, PhD *

**PURPOSE**

To optimize administration techniques of contrast medium (CM) in abdominal CT perfusion CT

**METHOD AND MATERIALS**

One hundred twenty eight patients (male:82, female: 46, mean: 68.0 years) underwent upper abdominal CT perfusion. Scans (0.5mm x 320, 80kV, 210-250mA) were conducted 7 to 120 secs after administration of CM and 25-ml saline chaser. The patients were randomly divided into 4 groups; group A (370 mCi/ml, 30 ml, 5 ml/s), B (370, 30, 5, 5 min after routine contrast-enhanced scan), C (370, 21, 3.5), and D (320, 30, 5). Demographic features and scan parameters (FOV, mA, CTDI, DLP) were recorded. Hepatic arterial and portal perfusion (HAP and HPP, ml/min/100ml), arterial perfusion fraction (APF, %), mean transit time (MTT, sec), and distribution volume (DV, ml/100ml) were calculated using dual-input maximum slope (dMS), deconvolution (dDC), and compartment model (dCM) methods using the same ROIs and on a prototype software. Arterial perfusions (AP), MTT, and DV of pancreas, spleen, gastric wall were calculated using single-input MS, DC, and CM (sMS, sDC, sCM) methods. The values were compared among the groups.

**RESULTS**

There was no significant difference in demographic features, scan parameters, HPP, and APF. Significant differences (CONCLUSION)

When using different CM administration techniques, perfusion measurement is most robust in the liver. This was the most robust method and HPP, APF, and MTT are robust parameters in the upper abdomen. Perfusion CT immediately after routine contrast-enhanced
To briefly describe and illustrate anatomical consideration of the peritoneum, mesentery and omentum; and to discuss and illustrate extramural vascular invasion, and lymph node status.

**PURPOSE/AIM**

To evaluate if IO-CEUS and CCE allow a differentiation between malignant and benign liver lesions in comparison to histopathology.

**METHOD AND MATERIALS**

Retrospective evaluation of digitally stored intraoperative CEUS examinations. IO-CEUS and CCE of 59 liver lesions were compared to histopathology following surgical resection. Examinations were performed by one experienced examiner using a multifrequency linear probe (6-9 MHz, LOGIQ E9/GE). Loops of CEUS were evaluated during the arterial (15-45s), the portal venous (60-90s) and the late-venous phase (2-5 min). Characterization of the CCE quality using digital cine-loops >10 s, based upon a color coding system. Semi-quantitative evaluation of the lesions' stiffness based upon a specified scaling of 0-6 (0 low up to 6 high) using 6 ROIs (1 in the center, 5 in the marginal zone).

**RESULTS**

Lesion diameter from 7 φ 56 mm, mean 26 mm. All 54 malignant lesions (20 HCCs, 8 CCCs, 24 metastases) displayed a portal venous washout. 3 lesions that could not be characterized definitely using IO-CEUS and CCE, were found to be a partially thrombosed hemangioma, a granuloma and a dystrophic fibrosis by histopathology. 4 lesions were correctly diagnosed as complicated cysts using IO-CEUS. Overall sensitivity of IO-CEUS was 90%, PPV was 100%, NPV 40% and accuracy was 94%. Using CCE, malignant lesions were found to be inhomogenous, only partially indurated in 12 lesions, with a scaling of 5. In 13/59 lesions, only central indurations were visible (scaling 4-6). Sensitivity of the CCE was 65%, PPV was 94%, NPV 20% and accuracy was 71%.

**CONCLUSION**

IO-CEUS offers clear benefits for localization and characterization of liver lesions. CCE only sometimes allows a correct characterization of lesions.

**CLINICAL RELEVANCE/APPLICATION**

CEUS in comparison to US elastography (CCE) enables a more exactly intraoperatively localization and characterization of liver tumors before resection.

**LL-GIS-W9A • Colorectal Liver Metastasis Treated With 90Y Radioembolization and Classified as Stable by RECIST: What Do Growth Kinetics Tell Us?**

**PURPOSE**

To demonstrate the growth kinetics pattern of colorectal cancer liver metastases classified as stable disease by RECIST after treatment with yttrium 90 (90Y) radioembolization.

**METHOD AND MATERIALS**

This HIPAA compliant retrospective study was IRB approved. Sixty-three chemorefractory colorectal cancer liver metastases in 41 patients with one MDCT scan before and one after 90Y-radioembolization treatment were evaluated. Growth kinetics parameters analyzed were percentage growth rate (%GR) and reciprocal doubling time (RDT). For growth kinetics, negative values of %GR and RDT defined responders and positive values defined non-responders. Percentage change in the largest lesion diameter was used to classify lesion response to therapy according to RECIST.

**RESULTS**

The mean interval time between the treatment and the post therapy scan was 30 days. Forty-eight lesions (76.2%) classified as stable by RECIST had responded based on GK (%GR and RDT) while 15/63 (23.8%) lesions did not respond.

**CONCLUSION**

In patients with colorectal cancer liver metastases treated with 90Y radioembolization, there is discrepancy between RECIST classification and growth kinetics. RECIST stable disease may not be an accurate reflection of tumor growth kinetics.

**CLINICAL RELEVANCE/APPLICATION**

Stable disease category by RECIST may include lesions that have negative growth rate. Further studies of growth kinetics as a biomarker for response to radioembolization may be warranted.

**LL-GIE1237-WEA • High Resolution MRI of Rectal Carcinoma with Pathologic Correlation after Total Mesorectal Excision**

**PURPOSE/AIM**

The complete removal of the tumour-containing rectum and its draining lymph nodes as a distinct anatomic package is the essence of total mesorectal excision. Clear preoperative depiction of the fascial planes and nerve plexus and their relationship to the surgical planes of excision is critical. The aim of this exhibit is to describe the High Resolution MRI (HR MRI) appearance of these anatomic structures and to compare the findings of rectal cancer with histological correlation after total mesorectal excision of the rectum.

**CONTENT ORGANIZATION**

HR MRI plays a vital role in the pre and posttreatment assessment of primary rectal cancer. High-resolution T2-W imaging is the key sequence in the MRI evaluation of primary rectal cancer. 25 patients underwent HR MRI in a 1.5 T unit between October 2012 and March 2013. phased-array multichannel coils were used for signal reception. The MR sequences followed the standard rectal MRI protocol as described in the literature.

**SUMMARY**

HR MRI can accurately delineate the extent of primary tumours providing physicians, surgeons and radiotherapist with information regarding depth of tumour invasion, status of circumferential resection margin, relationship of the tumour to mesorectal fascia, extramural vascular invasion, and lymph node status.

**LL-GIE1246-WEA • Review of Anatomy and Imaging Based Approach to Primary and Secondary Diseases of the Peritoneum and Mesentery**

**PURPOSE/AIM**

To briefly describe and illustrate anatomical consideration of the peritoneum, mesentery and omentum; and to discuss and illustrate
CONTENT ORGANIZATION
The peritoneum is a serosal membrane, with most complex structure, encasing the peritoneal cavity; mesentery and omentum being the double fold of peritoneum. We will discuss and illustrate anatomical consideration of the peritoneum, mesentery; and multimodality imaging of the following pathologies:

Benign: Duplication cyst, lymphangioma, peritoneal inclusion cyst, hydatid cyst, pseudocyst, abscess, omental infarct/ fat necrosis, panniculitis, sclerosing mesenteritis, desmoid tumor/ fibromatosis, granulomatous peritoneal disease
Tumor like conditions: splenosis, endometriosis, sclerosing encapsulating peritonitis
Malignant: Lymphoma, carcinoma, gastrointestinal stromal tumor, malignant mesothelioma, peritoneal carcinomatosis (primary/ secondary), pseudomyxoma peritonei

SUMMARY
There is significant overlap in the appearance of several pathologic entities affecting the peritoneum, omentum and mesentery, and reaching the accurate diagnosis may be challenging. Knowledge of the normal anatomy and pathways of disease extension can help narrow the differential diagnosis and assess associated complications.
The prevalence of internal hernia is increasing due to increased rate of operative abdominal intervention. Prompt radiological diagnosis is crucial to avoid unwanted surgery in a non-virgin abdomen.

**A single sign is not enough for the diagnosis of internal hernia. I suggest a combination of Swirl sign, local bowel gathering and bowel dilatation were found to be the best combination for diagnosis of internal hernia.**

**CONCLUSION**

A single sign is not enough for the diagnosis of internal hernia. I suggest a combination of Swirl sign, local bowel gathering and bowel dilatation were found to be the best combination for diagnosis of internal hernia. Still disease like cocoon syndrome will remain difficult to diagnosis in radiology.

**CLINICAL RELEVANCE/APPLICATION**

Quantitative iodine-based material decomposition images with spectral CT can be used to evaluate the activity of Crohn's disease.  

**PURPOSE**

To evaluate the role of quantitative iodine-based material decomposition images with spectral CT in predicting the disease activity of Crohn’s disease (CD)

**METHOD AND MATERIALS**

63 patients with a proven diagnosis of CD participated in this prospective study. CD was diagnosed by clinical, enteroscopic and pathologic manifestations. Clinical remission was identified by experienced gastroenterologists using the criteria of clinical, endoscopy and laboratory tests. All patients underwent CT enterography (CTE) with spectral imaging mode on a GE Discovery CT756HD scanner. The iodine densities of disorder bowel walls, which were normalised to those of the psoas muscle, were measured and statistically compared on iodine-based material-decomposition CT images. The ROI sizes range from 15 mm2 to 30 mm2 based on the lesion size. The iodine densities were measured on both arterial phase (AP) and venous phase (VP). The two-sample t test was performed to compare quantitative parameters between active and remittent CD.

**RESULTS**

A total of 44 disorder bowel segments were detected on CTE in 19 patients to have active disease (n=44), while 49 segments were detected in 23 patients to be remission (n=49). There was a significant difference for the normalized iodine density of the bowel wall between the patients to have active CD [4.66 mg/mL (3.37 to 7.09 mg/mL)] and the patients to be remission [2.59 mg/mL (1.00 to 3.80 mg/mL)] on AP (DF=40 P < 0.0001). And there was also a significant difference of the bowel wall iodine density between the patients with active CD [3.75 mg/mL (1.91-6.63 mg/mL)] and those to be remission [2.78 mg/mL (1.76-3.55 mg/mL)] on VP (DF=40 P = 0.0001).

**CONCLUSION**

It is feasible to perform quantitative iodine-based material decomposition images with spectral CT for evaluation of CD, and this method may be used as a predictor in distinguishing active and remittent CD.

**CLINICAL RELEVANCE/APPLICATION**

Quantitative iodine-based material decomposition images with spectral CT can be used to evaluate the activity of Crohn’s disease.

**PURPOSE**

Trying to define the most valuable radiological sign(s) for the diagnosis of internal hernias and their mimics; mainly cocoon syndrome and adhesions.

**METHOD AND MATERIALS**

In a period of 32 consecutive months; a total of 240 patients were admitted with abdominal pain with signs of remittent or persistent intestinal obstruction. Among those patients; 180 cases had history of previous abdominal operative intervention. All cases are subjected to multislice CT examination of internal hernias. The cases radiological profiles were revised in retrograde manner. The radiological diagnosis of possible internal hernia was wrong in three other cases. Two cases were finally diagnosed as cocoon syndrome.

**RESULTS**

The age of the patients varies between 22 and 63 years with average age of 36 +/- 2.3 years. Most of the patients were females with ratio of 2:1. The radiological signs used for the radiological diagnosis were: Swirl sign Local bowel gathering Bowel dilatation Abnormal position of the duodenojejunal junction Bowel other than duodenum posterior to the superior mesenteric artery. Distal jejunal anastomosis located to the right side Mushroom appearance. No single sign alone was efficient and consistent in the diagnosis of internal hernia. Swirl sign, local bowel gathering and bowel dilatation were found to be the best combination for diagnosis of internal hernia. There were no definite sign to differentiate between cocoon syndrome and internal hernia. Both cases have been operated and diagnosis was made intra-operatively.

**CONCLUSION**

A single sign is not enough for the diagnosis of internal hernia. I suggest a combination of Swirl sign, local bowel gathering and bowel dilatation in appropriate clinical settings for diagnosis of internal hernia. Still disease like cocoon syndrome will remain difficult to diagnosis in radiology.

**CLINICAL RELEVANCE/APPLICATION**

The prevalence of internal hernia is increasing due to increased rate of operative abdominal intervention. Prompt radiological diagnosis is crucial to avoid unwanted surgery in a non-virgin abdomen.
Schatzki Ring Treatment with Acid-suppressive Medication Improves Symptoms and Ring Diameter

Sean Novak MD (Presenter) * ; Michael J Shortsleeve MD

PURPOSE
Schatzki (lower esophageal) rings are a common cause of dysphagia and esophageal food impaction. While many of these rings are diagnosed radiographically on double-contrast fluoroscopic examinations, typical therapy involves referral to a gastroenterology specialist for procedural dilation with an endoscopic balloon or other device. The dilation procedures are invasive and expose the patient to the risk of esophageal perforation. There is a partial association between acid reflux and Schatzki rings, although many of these rings occur in patients without known gastroesophageal reflux disease. We hypothesized that medical treatment with acid-suppressive medications, particularly proton-pump inhibitors, might be a reasonable alternative for Schatzki ring treatment.

METHOD AND MATERIALS
In this proof-of-concept study, we treated three patients who had symptomatic Schatzki rings with an oral proton-pump inhibitor (omeprazole) for a mean of 10 months (range 5 to 12 months). Double-contrast barium esophagrams were performed prior to and following treatment for all patients. In two patients, pre- and post-treatment 13 mm barium tablet swallowing testing was performed.

RESULTS
Prior to treatment, the mean Schatzki ring diameter was 11 mm (range 9 to 13 mm). After treatment, the mean ring diameter increased to 15 mm (range 14 to 15 mm). All patients reported subjective improvement in dysphagia symptoms. Of the two patients with 13 mm barium tablet swallow tested, pre-treatment the tablet paused at the ring for 3 minutes for the first patient, and briefly for the second patient. Post-treatment, the tablet passed easily without pause or obstruction for both patients. All patients tolerated the treatment well. There were no complications.

CONCLUSION
Acid-suppressive medication improves dysphagia symptoms and ring diameter in patients with symptomatic Schatzki rings, and is an effective alternative to procedural dilation.

CLINICAL RELEVANCE/APPLICATION
Dysphagia in patients with Schatzki rings can be treated with acid-suppressive medication as an effective alternative or addition to procedural dilation.
TRANSJUGULAR LIVER BIOPSY

1. Define coagulopathy.
2. Discuss benefits and drawbacks of transjugular and percutaneous liver biopsy.
4. Outline the rationale for percutaneous liver biopsy followed by laser photocoagulation in patients with coagulopathy.
5. Describe the photocoagulation technique.
6. Present cases of percutaneous liver biopsy followed by laser photocoagulation.

SUMMARY

Transjugular liver biopsy is used in patients with coagulopathy, as bleeding is reduced by egress into the hepatic veins. Transjugular liver biopsy, however, provides less diagnostic specimens. While percutaneous liver biopsy provides more diagnostic specimens, studies have shown a risk of hemorrhage. Laser photocoagulation has been used in the treatment of peptic ulcers and telangiectasias, opening the door to its use as an adjunct for other interventions. This exhibit aims to outline the rationale for percutaneous liver biopsy followed by laser photocoagulation as an alternative to transjugular liver biopsy in patients with coagulopathy and demonstrate its feasibility, efficacy, and safety.

LL-GIS-WE7B • The Importance of Measuring Pancreatic Cystic Lesions Accurately on MRI: An Assessment of Inter-observer Variability and Impact on Patient Management

Dell P Dunn MD (Presenter) ; Olga R Brook MD * ; Alexander Brook PhD * ; Giselle Y Revah MD ; Sumayya S Jawadi MD ; Karen S Lee MD ; Maryellen R Sun MD * ; Koenraad J Mortele MD

PURPOSE

The purpose of this study is to assess inter-observer variability in measurements of pancreatic cystic lesions on MRI and its impact on patient management using current guidelines.

METHOD AND MATERIALS

In this IRB-approved, HIPAA-compliant study, 144 MRI examinations in patients with pancreatic cystic lesions were reviewed by 2 fellowship-trained abdominal imagers, each with 6 yrs of experience, and 2 abdominal imaging fellows. The studies were selected to provide an even distribution of pancreatic cystic lesions ranging in size from 5 to 35mm. The reviewers were instructed to record the single largest measurement according to their standard clinical practice using the plane and sequence of their choice. These measurements were then placed into 4 categories delineated by current management guidelines.

RESULTS

There was moderate overall agreement (kappa = 0.55) for the four readers, however all 4 readers placed the cystic lesion into the same management category in only 65/145 cases (45%). Pairwise comparison of agreement between individual readers yielded kappa ranging from 0.46 to 0.61, with the highest agreement found between the two most experienced readers and the least agreement between the two less experienced readers. The intraclass correlation coefficient, a measure of quantitative agreement on lesion size, showed strong agreement with a value of 0.80. The within-subject standard deviation increased with increasing lesion size, ranging from 2.7mm±0.3mm for lesions 5mm or less.

CONCLUSION

There is significant variability in the measurement of cystic pancreatic lesions on MRI that could lead to erroneous reporting of growth or unwarranted changes in management.

CLINICAL RELEVANCE/APPLICATION

MRI measurements of pancreatic cystic lesions can vary significantly between readers with impact on patient management. Standardization of measurement technique may reduce variability and should be explored.

LL-GIS-WE8B • Lobar Distribution of Liver Metastases from Pancreatic Carcinoma: Is there a 'Fast Track' from the Body-tail to the Left Liver Lobe?

Giulia A Zamboni MD (Presenter) * ; Maria Chiara Ambrosetti MD ; Fabio Lombardo ; Roberto Pozzi Mucelli

PURPOSE

To assess if the different site of pancreatic adenocarcinoma is related to a different lobar distribution of metastases within the liver.

METHOD AND MATERIALS

From all the patients who underwent MDCT for first staging of pancreatic adenocarcinoma, we selected 51 consecutive patients (26 Males, 25 Females; mean age 60 yrs) with pathologically-proven liver metastases. 23 patients had a tumor in the head (Group A) and 28 in the body-tail (Group B). We analyzed site, diameter and vessel invasion of the pancreatic adenocarcinoma and number of metastases in each lobe of the liver (divided by using Cantlie's line). Total number of metastases was compared between the two groups with an unpaired t-test. Fisher's test was used to compare the number of metastases in the two lobes.

RESULTS

As expected, because of the delayed clinical symptoms in patients with adenocarcinoma of the tail of the pancreas, the number of liver metastases at diagnosis was significantly higher in group B than in group A (p<0.05). Although liver metastases are more numerous in the right than in the left lobe in both groups, there is a significant difference in the ratio of metastases between the right and the left lobes in the two groups of patients. This phenomenon can support the existence of a fast track to the left liver lobe when the carcinoma invades the splenic vein, and may help in detection of liver metastases.

CONCLUSION

Pancreatic tumor location appears to affect the lobar distribution of metastases within the liver, potentially aiding their early identification.
**Gastrointestinal (CT Technique: Intravenous Contrast)**

**Wednesday, 03:00 PM - 04:00 PM • E353A**

**SSM06 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1**

**Moderator**

Laura R Carucci, MD

**Moderator**

Gregory Sack, MD

**SSM06-01 • Improved Contrast Enhancement in Computed Tomography of the Liver by Using a Bolus Shaping Software: First Clinical Results**

**Boris Schulz** MD (Presenter) ; **Thomas J Vogl** MD, PhD ; **Boris Bodelle** MD ; **Renate M Hammerstingl** MD

**PURPOSE**

To evaluate image quality of a newly available bolus shaping software (Optibolus, Covidien) for contrast enhanced computed tomography (CT) of the abdomen in comparison to standard monophasic contrast administration.

**METHOD AND MATERIALS**

72 patients received contrast enhanced computed tomography of the abdomen twice during clinical follow up. The first time (group 1) a monophasic injection protocol was chosen with 90ml (400mg Iodine per ml) concentration 400mg/ml), for the second examination (group 2) the patients received 103ml contrast medium (350mg Iodine per ml). Both flow rates started with 2 ml per sec, the bolus shaping software however reduced the flow during injection to 1.7ml. Attenuation values (HU) of the liver, aortocaval lymph nodes, abdominal aorta and portal vein of both groups were compared to analyze contrast enhancement.

**RESULTS**

Average attenuation of the liver was 99HU (range: 82-105HU) (group 1) vs. 104 HU (range: 92-107HU) (group 2) (p = 0.64). Portal vein enhancement was 148HU (range: 125-155HU) vs. 169 HU (158-189HU) (p = 0.31), enhancement of the aorta was measured with 130HU (range: 105-138HU) vs. 140 HU (range 119-152HU) (p < 0.01). Lymph node enhancement was similar with an average of 37HU (range: 28-47HU) resp. 33HU (range: 15-41HU) (p=0.75).

**CONCLUSION**

Lower iodine concentration does not lead to a lesser enhancement of the liver or great abdominal vessels when using the proposed bolus shaping software.

**CLINICAL RELEVANCE/APPLICATION**

By using the proposed software comparative contrast enhancement is possible even when using less concentrated contrast medium.
the very high weight groups (96 kg or heavier in particular), the total contrast medium dosage restrictions resulted in lower iodine volumes (less than 499 mgI/kg), and the contrast effects were somewhat inferior to the other body weight groups.

CONCLUSION
When conducting abdominal CT with weight-specific doses, fixed injection times, bolus tracking, and saline flushing, and selection of different contrast medium volumes and concentrations for each group makes it possible to maintain necessary iodine volumes and reduce waste of contrast medium. In addition, it makes it possible to inhibit excessively fast injection speeds.

CLINICAL RELEVANCE/APPLICATION
Abdominal Contrast-enhanced Computed Tomography using Weight-specific Doses and Fixed Injection Time is recommended.

SSM06-03 ● Comparison of Four Contrast Injection Protocols with a Combination of Fixed Injection Duration and Patients’ Body-weight-Tailored Dose of Contrast Material for Multiphasic Hepatic CT: A Prospective Randomized Study

Masakatsu Tsurusaki MD, PhD (Presenter); Keitaro Sofue; Tomoko Hyodo MD; Yukinobu Yagyu MD; Mitsuaki Matsuki MD; Takamichi Murakami MD, PhD; Masahiro Okada MD

PURPOSE
We performed a prospective randomized study using 4 protocols for multiphasic hepatic CT applying a combination of fixed injection duration and patients’ body-weight-tailored dose of contrast material, and to compare the quantitative and qualitative analyses among 4 protocols.

METHOD AND MATERIALS
RESULTS
The contrast enhancements of the aorta during the arterial phase were Group A/B/C/D=228.8/189.9/236.5/244.4 (HU), and there was no significant difference among Groups A, C, and D; furthermore, there was no difference in visual evaluation. The contrast enhancements of hepatic parenchyma during the portal and equilibrium phase were A/B/C/D= 41.8/42.3/58.7/50.9 (HU) and A/B/C/D= 36.7/37.4/44.9/42.4 (HU), respectively. There were significant differences between Group A and B, as well between as Group C and D, and also there is significant difference of visual evaluation of portal vein and hepatic parenchyma between C and other protocols.

CONCLUSION
Contrast enhancement of the aorta was dependent on fractional dose, while that of hepatic parenchyma was dependent on iodine dose. Good contrast enhancement of both the aorta and hepatic parenchyma could be achieved by using Group C, which indicated the potential usefulness of this method.

CLINICAL RELEVANCE/APPLICATION
A new protocol using longer injection duration of 38sec and middle concentration of contrast material may yield satisfactory enhancement.

SSM06-04 ● A Study of Reducing Contrast Agent Dose in Abdominal CTA

Weibing Wang MMed (Presenter); Jinbai Huang MA; Jie Peng MMed; Jing Luo MMed

PURPOSE
To evaluate the image quality and the diagnostic value of using Low contrast dose, low contrast concentration and low flow rate for abdominal CTA on spectral CT imaging.

METHOD AND MATERIALS
RESULTS
The image quality in both groups met the diagnostic need. The optimal keV for abdominal CTA in spectral CT imaging was 50.98±0.85keV. There was no statistical difference for CNR and the display ratio of right gastroepiploic artery between optimal keV and conventional CT images(26.32±6.95 vs27.36±7.05)(88.3% vs81.7%),(p>0.05).Total contrast dose for CT scans was 60ml in group A, 14% less than the 70ml in group B. Total contrast concentration was 300mgI/ml in group A, 14% less than the 300mgI/ml in group B. The injection speed was 3ml/s in groupA, 40% less than 5ml/s in group B.There was no significant difference in CTDIw between 2 groups (16.87mGy vs 14.98±8.12mGy)(P>0.05).

CONCLUSION
The use of low contrast dose, low contrast concentration and low flow rate combined with spectral CT imaging provided contrast dose, contrast concentration and injection speed reduction with similar or better image quality in comparison with the conventional CTA protocol.

CLINICAL RELEVANCE/APPLICATION
The study makes it possible to undergo abdominal CTA scan with lower contrast agent dose, concentration and flow rate for abdominal CTA.

SSM06-05 ● Reduction of Total Iodine Dose by Using Low Tube Voltage and High Tube Current Technique in Combination with Adaptive Statistical Iterative Reconstruction for Dynamic CT of the Pancreas

Yoshifumi Noda MD (Presenter); Satoshi Goshima MD, PhD; Hiroshi Kawada MD; Haruo Watanabe MD; Hiroshi Kondo MD; Masayuki Kanematsu MD; Nobuyuki Kawai MD; Yukichi Tanahashi MD; Kyongtae T Baeg MD, PhD*

PURPOSE
To prospectively compare a low tube voltage (80-kVP) with a conventional (120-kVP) CT protocol for contrast enhancement degree of vascular and pancreatic parenchyma, image quality, and detectability of pancreatic cancer.

METHOD AND MATERIALS
Institutional review board approval and written informed consent was obtained. During a 10 months period, 136 patients (66 man, 70 woman, age range 21-86 years, mean age 65.9±11.0 years) with suspicious having pancreatic disease were randomized into three groups according to the following iodine-dose per body-weight protocols: 600 mgI/kg at 120-peak kilovoltage (kVP) (Group 1), 500 mgI/kg at 80-kVP (Group 2), and 400 mgI/kg at 80-kVP (Group 3). One way analysis of variance were conducted to evaluate differences in CT number, back ground noise, signal-to-noise ratio (SNR), DLP, effective dose (ED), tumor-to-pancreas contrast-to-noise ratio (CNR), and figure of merit (FOM). Receiver operating characteristic (ROC) curves were fitted to blinded observer’s confidence ratings. Sensitivity, specificity, and area under the ROC Curve (AUC) were compared to assess the detectability of pancreatic cancer.

RESULTS
47 patients (20 men, 27 women, mean 62.2 years, age range 42-85 years) with 53 pancreatic cancers (mean size, 30.2 mm; range, 6.0-89.0 mm) were identified. Compared with group 1 and 3, group 2 demonstrated significantly higher contrast enhancement and SNR of the aorta (P < .001) and pancreas (P < .001), and CNR (P = .004) in pancreatic parenchymal phase (PPP), and portal vein (P < .001) and liver (P < .001) in portal venous phase, respectively. There was no significant difference in FOM, the image quality, and radiation
Ultrasound (EUS) in distinguishing low-stage disease (T1 and T2) from advanced T-stage disease. We also compared the diagnostic accuracy of PET-CT with endoscopic findings as the gold standard.

**RESULTS**
Mean CEIs for groups A, B and C were respectively 49.37 HU (±7.2), 58.04 HU (±11.3), 54.55 HU (±8.9). Liver enhancement achieved injecting Iodixanol 320 was significantly higher at 100 kV if compared with imaging at 120 kV (P = 0.0369; CI 0.67-18.2). Liver enhancement achieved injecting Iomeprol 400 at 120 kV (P = 0.4183; CI -5.581 -12.56). Liver enhancement achieved injecting Iomeprol 400 at 120 kV was not significantly different from that achieved injecting Iodixanol 400 at 120 kV (P = 0.0526; CI -12 -0.07). No significant differences were observed in terms of image quality among the three groups.

**CONCLUSION**
Similar liver enhancement values were observed injecting a lower amount of Iodixanol 320 compared to the ones achieved injecting Iomeprol 400. Values were even more similar when images obtained at 100 kV with Iodixanol 320 were compared to the ones obtained at 120 kV with Iomeprol 400 with no significant differences in terms of image quality.

**CLINICAL RELEVANCE/APPLICATION**
Liver imaging with Iodixanol 320 can be performed with a lower iodine dose and low kV protocol.

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<th>Wednesday, 03:00 PM - 04:00 PM • E353B</th>
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<tr>
<td><strong>SSM07-01 • Esophageal Carcinoma: Evaluation with Diffusion-tensor MR Imaging and Tractography Ex Vivo</strong></td>
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<tr>
<td>Ichiro Yamada MD (Presenter) ; Keigo Hikishima PhD, MS ; Naoyuki Miyasaka MD ; Yutaka Tokairin MD ; Tatsuyuki Kawano MD ; Eisaku Ito MD ; Daisuke Kobayashi MD ; Yoshinobu Eishi MD ; Hideyuki Okano MD, PhD ; Hitoshi Shibuya MD</td>
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</table>
| **PURPOSE**
To determine the usefulness of diffusion-tensor MR imaging and tractography for evaluating the depth of mural invasion by esophageal carcinomas. |
| **METHOD AND MATERIALS**
Twenty esophageal specimens containing 20 carcinomas were studied using a 7.0-T MR system with a four-channel phased-array surface coil. Diffusion-tensor MR imaging was performed by using a diffusion-weighted spin-echo pulse sequence based on a Stejskal-Tanner diffusion preparation. The imaging parameters were: repetition time, 3000 msec; echo time, 25 msec; field of view, 50x60 x 25-30 mm; matrix, 256 x 128; section thickness, 1 mm without intersection gaps; voxel size, 0.195-0.234 x 0.195-0.234 x 1 mm (0.038-0.055 mm3); number of excitations, two; b value, 0 sec/mm2 or 1000 sec/mm2; and motion-probing gradient, in seven noncollinear directions. Diffusion-tensor MR images were computed with TrackVis software. MR images were compared with the histopathologic findings as the gold standard. |
| **RESULTS**
Diffusion-tensor MR imaging and tractography are capable of clearly depicting the individual tissue layers of the normal esophageal wall, and they have excellent diagnostic accuracy for evaluating the mural invasion of esophageal carcinomas. Thus, they may make it possible to noninvasively diagnose the depth of mural invasion by esophageal carcinomas. |
| **CONCLUSION**
Diffusion-tensor MR imaging and tractography may provide a new tool to noninvasively diagnose the depth of mural invasion by esophageal carcinomas. |
| **CLINICAL RELEVANCE/APPLICATION**
Diffusion-tensor MR imaging and tractography may provide a new tool to noninvasively diagnose the depth of mural invasion by esophageal carcinomas. |
| **SSM07-02 • Is PET-CT a Better Tool than EUS for Preoperative Staging of Esophageal Cancer? A Comparative Study** |
| Seyed Mahdi Abtahi MD (Presenter) ; Azadeh Elmi MD ; Yingbing Wang MD ; Yuen Chi Ho ; Sandeep S Hedgire MD ; Mukesh G Harisinghani MD |
| **PURPOSE**
Currently, there is no single ideal staging modality for preoperative staging of esophageal cancer. The aim of this study was to assess the role of PET-CT in the pretreatment staging of esophageal cancer. We also compared the diagnostic accuracy of PET-CT with endoscopic ultrasound (EUS) in distinguishing low-stage disease (T1 and T2) from advanced T-stage disease. |
METHOD AND MATERIALS

RESULTS
The overall accuracy of PET-CT in predicting the correct stage was significantly higher than EUS (p=0.002). However, there was no significant difference in comparison made for T-staging between the two modalities (p-value= 0.247). Correct T-staging was performed by PET-CT in 72.2% and by EUS in 55.58% of the patients. Overstaging was more observed by EUS (p=0.008). The sensitivity of the modalities was similar for distinguishing advanced T-stage from low-stage disease; however, the specificity was significantly higher for PET-CT (95.9% vs. 62.5%, p=0.006). The performance of PET-CT for evaluating nodal involvement was significantly higher than EUS (accuracy of 91.4% and 73.6%, respectively, p=0.002). The sensitivity and specificity for distant metastasis were 82.5% and 93.7% for PET-CT and 75% and 81% for EUS.

CONCLUSION
Combination of PET-CT has a superior overall staging ability over EUS in our study group especially for nodal and distant disease staging. The tests showed similar performance in tumoral staging while PET-CT demonstrated improved specificity in distinguishing advanced T-stage disease.

CLINICAL RELEVANCE/APPLICATION
Integration of PET-CT into the staging work-up of esophageal cancer may improve the accuracy compared with EUS alone. PET-CT may contribute to better treatment planning for advanced T-stage disease.

SSM07-03 • Chemotherapy Response in Gastroesophageal Tumours with Magnetic Resonance and 18F-FDG-PET/CT: Correlation of Apparent Diffusion Coefficient (ADC) and Partial Volume Corrected Standardized Uptake Value (PVC-SUV) with Tumour Regression Grade (TRG)
Francesco Giganti MD (Presenter) ; Francesco A De Cobelli MD ; Carla Canevari MD ; Francesca Gallivanone ; Carlo Staudacher MD ; Alessandro Del Maschio MD

PURPOSE
Patients with locally advanced gastroesophageal tumours (GT) or adenopathies are treated with neoadjuvant chemotherapy (NC) to make radical resection possible. TRG is a histological objective indicator of treatment response which scores residual tumour in 5 grades, after resection. Aim of our study was to compare ADC and PVC-SUV changes during NC with TRG to evaluate if molecular imaging biomarkers from Diffusion Weighted Imaging (DWI) Magnetic Resonance (MR) and 18F-FDG-PET/CT may help to differentiate between Responders (R) and Non Responders (NR) to NC.

METHOD AND MATERIALS
31 patients affected by GT (7 esophageal,3 gastro-esophageal junction, 21 stomach) were evaluated on a 1.5-T MR system including DWI performed using b value of 0 and 600 s/mm2, before and 3 weeks after the end of NC and ADC were calculated. Patients also underwent a basal and a follow up 18F-FDG-PET/CT scan, before and after NC, and PVC-SUV were obtained, as quantitative PET biomarkers.

RESULTS

CONCLUSION
DWI-MR, which can be performed in a relatively short examination time compared to 18-FDG-PET/CT, may become an important imaging technique in evaluating CT response in patients with GT. Our study suggests that DWI-MR is potentially capable of offering more accurate information for treatment response than 18-FDG-PET/CT in these Patients and modifications of ADC may represent a reproducible tool to assess tumor response to NC.

CLINICAL RELEVANCE/APPLICATION
DWI-MR and ADC modifications are potentially capable of offering more accurate information for treatment response than 18-FDG-PET/CT in gastroesophageal cancers.

SSM07-04 • Diagnosing Leak after Esophagectomy for Esophageal Cancer by CT-esophageal Protocol (CTEP) and Standard Esophagram (SE): Is the Old School Still the Best School?
Diana M Palacio MD (Presenter) ; Wayne L Hofstetter ; Arlene M Correa PhD ; Sonia L Betancourt Cuellar MD ; Edith M Marom MD

PURPOSE
This retrospective study, compares CTEP and SE, alone or in combination, to the clinical diagnosis of leak established by endoscopy, operation and/or clinical course.

METHOD AND MATERIALS
We reviewed the charts of patients who underwent esophagectomy for esophageal cancer between 1/2005 to1/2009. A final diagnosis of leak was made based on a combination of clinical course, endoscopic and/or surgical evaluation: Type0= No leak. Type1= Subclinical leak, imaging diagnosis only. Type2= Clinical suspicion for leak +/- positive imaging, conservative management. Type3= Clinical suspicion for a leak, +/- positive imaging, requiring an intervention. Type 4= Conduit necrosis diagnosed at re-operation, +/- positive imaging. Reports of all diagnostic CT-EP and SE performed < 31 days post-op were reviewed and the diagnosis of leak classified as either small/contained vs. large/uncontained. A cross match between the clinical leak diagnosis and the imaging results was made.

RESULTS

CONCLUSION
SE alone has higher S, S, PPV, and NPV than CTEP alone for identification of leak. Although SE+CTEP slightly improves sensitivity, the specificity only improves compared to CTEP alone. CTEP had greater false+ and false- than SE. SE may continue to be the imaging method of choice to evaluate anastomotic leak.

CLINICAL RELEVANCE/APPLICATION
Despite the increased availability and usage of Chest CT-EP, when an esophageal leak is suspected after esophagectomy, an esophagram is recommended due to its greater accuracy as compared to CT.

SSM07-05 • The Sensitivity and Specificity of Diagnosing Eosinophilic Esophagitis in Adults on Barium Swallow Examination with Histology as the Gold Standard
Dhiraj Joshi MD, MRCS (Presenter) ; Jonathan C Rodrigues MBBCh, MRCP ; James P Virjee MBChB, FRCR

PURPOSE
Eosinophilic esophagitis (EE) is a chronic inflammatory condition of the esophagus that presents with symptoms of dysphagia and food bolus impaction. The patients are referred for barium swallow examination (BSE) either from the community or following inconclusive endoscopy. The aim of this study was to determine the sensitivity and specificity of BSE for diagnosing EO by using histology as the gold standard. Established radiological features from previous studies were used.

METHOD AND MATERIALS
The number of radiologically diagnosed cases of EE from all outpatient BSE performed over a 2-year period was determined from the radiology database. The total number of histologically proven cases of EE was determined from the histopathology database. This data
RESULTS
A total of 824 outpatient BSE were performed for a variety of oesophageal symptoms. Sixteen patients were diagnosed as EE of which 14 patients were confirmed to have EE on subsequent histology. Fifteen patients were diagnosed with EE on histology, which also included the 14 patients that were diagnosed by BSE. One patient was diagnosed on a random endoscopic biopsy but had not undergone BSE. The most common symptom was intermittent dysphagia (14 patients) followed by food bolus obstruction (10 patients). The most common radiological feature was presence of ring deformity (16 patients), followed by a fixed stricture (5 patients). The true positives were 87.5%; false positives, 12.5%; true negatives, 100%; false negatives, 0%. This sensitivity of diagnosing EE on BSE was 100% and specificity was 99.7%.

CONCLUSION
Correctly timed oral administration of effervescent powder results in good distension of the esophagus, allowing ready assessment of the wall at contrast enhanced CT.

CLINICAL RELEVANCE/APPLICATION
Oral administration of effervescent powder is a feasible technique resulting in good distension of the esophagus, allowing readily assessment of the wall at contrast enhanced CT.

SSM07-06 • Oral Effervescent Powder Administration for Multidetector CT Evaluation of the Esophagus - A Validation Study

Kristina I Ringe MD (Presenter) ; Simone Meyer ; Frank K Wacker MD * ; Hans-Juergen Raatschen MD

PURPOSE
To quantitatively and qualitatively assess the value of oral effervescent powder administration for CT evaluation of the esophagus in patients without underlying esophageal disease.

METHOD AND MATERIALS
This prospective study was IRB approved. 42 patients (27 males/15 females, mean age 57y) who where referred for thoraco-abdominal staging CT were included. Contrast-enhanced CT was performed on a 64-slice scanner after oral administration of 3g effervescent powder immediately before image acquisition. Distension of the esophagus was assessed at three levels (proximal/middle/distal) by volumetry of the inner (ID) and outer diameter (OD), using a thin client software. In addition, esophageal distension in the corresponding segments was evaluated qualitatively separately by two blinded readers on a three-point scale. Further, at an interval of two weeks, both readers in consensus decided on the number of diagnostic esophageal segments in each patient in terms of the possibility to decide upon a potentially underlying pathology. Findings were compared with results from an age and sex matched control group (42 patients; 30 males, 12 females; mean age 62 y). Quantitative and qualitative results of both groups were compared (T-Test, Mann-Whitney-U-Test). Inter-observer variability was calculated (weighted-Cohen-k).

RESULTS
ID and OD in all esophageal segments were significantly larger after effervescent powder administration as compared to the control group (p<0.001). A total of 824 outpatient BSE were performed for a variety of oesophageal symptoms. Sixteen patients were diagnosed as EE of which 14 patients were confirmed to have EE on subsequent histology. Fifteen patients were diagnosed with EE on histology, which also included the 14 patients that were diagnosed by BSE. One patient was diagnosed on a random endoscopic biopsy but had not undergone BSE. The most common symptom was intermittent dysphagia (14 patients) followed by food bolus obstruction (10 patients). The most common radiological feature was presence of ring deformity (16 patients), followed by a fixed stricture (5 patients). The true positives were 87.5%; false positives, 12.5%; true negatives, 100%; false negatives, 0%. This sensitivity of diagnosing EE on BSE was 100% and specificity was 99.7%.

CONCLUSION
In an appropriate clinical setting, BSE can be used as a reliable investigation for the diagnosis and management of EE.

CLINICAL RELEVANCE/APPLICATION
EE is often erroneously treated for reflux esophagitis. BSE can help in appropriate diagnosis and management of difficult cases.

SSM08-01 • The Activity Grade of Hepatitis Affects Liver Stiffness Measured Using MR Elastography

Tomohiro Takamura (Presenter) ; Shintaro Ichikawa MD ; Utaroh Motosugi ; Katsuhiko Sano MD ; Hiroyuki Morisaka MD ; Tomoaki Ichikawa MD, PhD *

PURPOSE
To elucidate the relationship between activity grade of hepatitis and liver stiffness measured using MR elastography (MRE).

METHOD AND MATERIALS
This study included 123 patients who underwent liver biopsy or surgery less than 2 months after MRE. The histological fibrosis scores and activity grades were as follows: F1, n = 19 (A1 = 12, A2 = 7, and A3 = 0); F2, n = 40 (A1 = 19, A2 = 20, and A3 = 1); F3, n = 32 (A1 = 9, A2 = 16, and A3 = 7); and F4, n = 32 (A1 = 6, A2 = 17, and A3 = 9). MRE was performed using 1.5T or 3T (Signa EXCITE HD or Discovery 750; GE Healthcare) scanners to measure liver stiffness in kilopascals (kPa). Stepwise multiple linear regression modeling was performed using the following variables as potential indicators: age, gender, body mass index (BMI), international normalized ratio of prothrombin time (PT-INR), platelet count, and METAVIR F score. Multiple linear regressions included variables maximizing the adjusted R2 in each stepwise regression to identify significant independent explanatory factors for liver stiffness and to delineate any inflammatory effects on liver stiffness after adjusting for nothing (model 1), alanine aminotransferase/upper limit of normal (ALTmeas/31 IU/L) categories (model 2), and METAVIR A grades (model 3). After adjusting for activity grade or ALT/ULN, the platelet count and METAVIR F score were found to be strongly associated with liver stiffness. The R2 value of model 3 (0.7390) was higher than those of model 1 (0.6821) and 2 (0.6852), indicating that activity grade correlates with liver stiffness.

CONCLUSION
While staging liver fibrosis using MRE, it is important to remember that the activity grade of hepatitis can affect liver stiffness measurement independent of the degree of fibrosis.

CLINICAL RELEVANCE/APPLICATION
Although liver stiffness measurement using MRE is useful for staging liver fibrosis, we should be aware that the activity grade of hepatitis can be a confounding factor in stiffness measurement.

SSM08-02 • Usefulness of Shear Wave Elastography (SWE) to Differentiate in Diffuse Hepatic Diseases

Min Yeong Kim MD (Presenter) ; Yong-Soo Kim MD, PhD ; Woo Kyoung Jeong MD ; Soon-Young Song ; Byung-Hee Koh MD ; On-Koo Cho MD, PhD

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SSM08-03 Visual Assessment of Diffusion MRI of the Liver: Do We Need Conventional Sequences and Contrast Enhanced Images in Every Case?

Veyssel Akgun MD (Presenter); Murat Kocaoglu MD; Bilal Battal; Yalcin Bozkurt; Mustafa Tasar MD

PURPOSE
The aim of this study is to assess the value of visual assessment of DWIs and ADC maps in determining hemangiomas and simple cysts without additional sequences and contrast medium administration and its capability in exclusion of malignancy.

METHOD AND MATERIALS
283 focal liver lesions (FLL) (69 malign, 214 benign) in 130 patients (74 men, 56 women, mean age 50.7, age range 15 to 80 years) that were detected in ultrasonography or computed tomography underwent MR and diffusion weighted imaging with non breath-hold single-shot echo-planar spin echo sequences. Most of the benign FLLs were cysts (n=89, 38.7%) and hemangiomas (n=96, 41.7%). The lesions that were hyperintense in all sequences and the lesions that were hyperintense on diffusion weighted images (DWI) with low b value and ADC maps and hypointense on DWIs with high b value were noted as hemangiomas and simple cysts, respectively. The signal intensities of the FLLs on DWIs with low and high b values and ADC maps were noted by two radiologists blinded to the pathological and radiological diagnoses in consensus. All FLLs were classified according to pathological diagnoses or radiologic follow-up. Then we formed a cross table to determine sensitivity, specificity, positive and negative predictive values for characterization of the simple cysts and hemangiomas and for exclusion of malignancy.

RESULTS
The sensitivity and specificity were 98.6% and 99.5%, respectively. The positive predictive value was 98.6% and negative predictive value was 98.6% for the visual assessment of the DWIs and ADC maps for the characterization of the hemangiomas and simple cysts in and exclusion of malignancy for these 185 FLLs.

CONCLUSION
Visual assessment of DWIs and ADC maps can be useful in characterization of the hemangiomas and simple cysts, and in exclusion of malignancy without additional sequences and contrast medium administration. As a consequence, this technique can decrease study time and cost.

CLINICAL RELEVANCE/APPLICATION
By using DWIs and ADC maps we can characterize most of the hemangiomas and simple cysts and exclude malignancy without additional sequences and contrast medium administration.

SSM08-04 Clinical Significance of Signal Heterogeneity in the Hepatobiliary Phase of Gadoxetic Acid-enhanced MR Imaging in Hepatocellular Carcinoma

Nobuhiro Fujita MD, PhD (Presenter); Akihiro Nishie MD; Yoshiki Asayama MD; Yasuhiro Ushijima MD; Yukihisa Takayama MD *; Hiroshi Honda MD; Dai Shimamoto; Ken Shirabe; Yuichiro Kubo MD

PURPOSE
To clarify the relationship between biological behavior of hepatocellular carcinomas (HCCs) and signal intensity in the hepatobiliary phase of gadoxetic acid-enhanced MR imaging with a special focus on its heterogeneity.

METHOD AND MATERIALS
A total of 68 patients with 70 pathologically proved HCCs who underwent gadoxetic acid-enhanced MR imaging prior to surgery were enrolled. Based on the signal intensity in the hepatobiliary phase, lesions were classified as homogeneously hypointense (n = 44), heterogeneously hypointense (n = 20) and homogeneously hyperintense (n = 6) groups, by comparing with the signal intensity of the background liver. The clinicopathological findings were compared among these three groups by Fisher’s exact test, Kruskal-Wallis test and Mann-Whitney U test where appropriate. The patient disease-free survival analysis was performed by the Kaplan-Meier method with the log-rank test and Cox proportional hazard model.

RESULTS
The tumor size and serum level of PIVKA-II were significantly higher in heterogeneously hyperintense group than homogeneously hypointense (P = .0155 and P = .0215) and hyperintense (P = .0330 and P = .0220) groups. In univariate analysis, heterogeneously hyperintense group showed lower disease-free survival rates than homogeneously hypointense group (P = .0125). In multivariate analysis, heterogeneously hyperintense group in the hepatobiliary phase of gadoxetic acid-enhanced MR imaging was an independent prognostic factor for disease-free survival (P = .0308).

CONCLUSION
Heterogeneously hyperintense HCCs in the hepatobiliary phase of gadoxetic acid-enhanced MR imaging have more malignant potential than other HCCs.

CLINICAL RELEVANCE/APPLICATION
Our study suggests that heterogenous hyperintensity in the hepatobiliary phase of gadoxetic acid-enhanced MR imaging is a new imaging biomarker to indicate malignant potential of HCCs.

SSM08-05 Intrahepatic Mass Forming Cholangiocarcinomas (IMCC): Utility of Feature Analysis for Differentiation from Other Intrahepatic Mass Lesions

Laura Heacock MS, MD (Presenter); Andrew B Rosenkrantz MD; Sooah Kim MD; Nicole M Hindman MD
ABSTRACT

Liver Remnant Regeneration in Donors after Living Donor Liver Transplantation: Long-term Follow-up Using CT and MR Imaging

Andreas Koops MD (Presenter) ; Philipp Simon MD ; Harald Ittrich MD ; Lutz Fischer ; Thorsten Klink MD ; Gerhard B Adam MD

PURPOSE

To assess liver remnant volume regeneration and maintenance, and complications in long-time follow-up of donors after living donor liver transplantation using CT and MRI.

METHOD AND MATERIALS

47 patients with a mean age of 33.5 years who donated liver tissue for transplantation and were available for follow-up imaging were included in this retrospective study. Contrast-enhanced CT and MR images were acquired according to standardized protocols of the upper abdomen. Two observers evaluated pre- and postoperative images, analyzed liver volume regeneration, and documented postoperative complications.

RESULTS

47 preoperative and 89 follow-up studies covered a mean period of 22.4 months (range, 1-84). Right liver lobe (segments V-VIII) was donated in 18 cases, left liver donation of segment II and III was performed in 24 cases, and of segments II-IV in 5 cases. Liver remnants regenerated rapidly within the first 6 months. After 36 months, the remnant volume was not significantly reduced compared to the preoperative liver volume (p=0.2155), and was maintained at a minimum of 80% in most patients. Minor postoperative complications were found early in 4 patients. No severe or late complications or mortality occurred.

CONCLUSION

Remaining liver volume regenerated rapidly in all donors, and was restored and maintained in most patients despite minor complications. No severe or late complications occurred during long-term follow-up.

CLINICAL RELEVANCE/APPLICATION

CT and MRI are valuable tools in the follow-up of donors after live liver transplantation.
MSSR44C • Interactive Case Discussion

Andras Palko MD, PhD (Presenter) * ; Ronald J Zagoria MD (Presenter)

LEARNING OBJECTIVES
1) Attendees will be able to better analyze CT scans for traumatic and non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia and injuries. 3) Attendees will learn the CT findings of common causes of a traumatic and non-traumatic ‘acute’ abdomen. 4) Attendees will learn the imaging findings of acute, traumatic and nontraumatic urinary tract and GI tract emergencies.

ABSTRACT
Using cases and an audience response system, this segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain and abdominal injuries. CT findings will be emphasized. Key imaging findings of traumatic and nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of blunt an penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

Controversy Session: The Evolving Role of Image-guided Pulmonary, Hepatic, and Renal Mass Biopsy: Current Indications and Controversies

Wednesday, 04:30 PM - 06:00 PM • S404AB

SPSC44 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5
Moderator
William W Mayo-Smith, MD *

LEARNING OBJECTIVES
1) To describe the current role of receptor studies in lung biopsy specimens. 2) To report what imaging and biochemical studies are diagnostic of hepatocellular carcinoma obviating the need for biopsy. 3) To describe the current and future indications for renal mass biopsy and why many, if not all small solid masses may need to undergo biopsy.

ABSTRACT

SPSC44A • Pulmonary Biopsy

Elizabeth H Moore MD (Presenter)

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSC44B • Liver Biopsy

Fred T Lee MD (Presenter) *

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSC44C • Renal Mass Biopsy

Stuart G Silverman MD (Presenter) *

LEARNING OBJECTIVES
View learning objectives under main course title.

Controversy Session: Controversies in Imaging Strategies for HCC in Cirrhosis

Wednesday, 04:30 PM - 06:00 PM • N227

SPSC46 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5
Moderator
Rendon C Nelson, MD *

LEARNING OBJECTIVES
1) To understand to optimal strategies for using CT and MRI to detect and stage hepatocellular carcinoma. 2) To understand the pharmacokinetic and imaging properties of various MR contrast agents and how to use them to optimize the detection and staging of hepatocellular carcinoma. 3) To learn how to implement the LiRads classification system into routine interpretation of hepatocellular carcinoma on CT and MRI.

SPSC46A • CT vs MR

Rendon C Nelson MD (Presenter) * ; Mustafa R Bashir MD (Presenter) *

LEARNING OBJECTIVES
1) To understand the optimal CT and MRI techniques for detecting and staging hepatocellular carcinoma. 2) To learn when CT is a more suitable choice or MRI is a more suitable choice for detecting and staging hepatocellular carcinoma.

ABSTRACT

SPSC46B • MR Contrast Agents (Hepatobiliary vs Purely Extracellular Agents)

Claude B Sirlin MD (Presenter) * ; John R Leyendecker MD (Presenter)

LEARNING OBJECTIVES
View learning objectives under main course title.
Controversy Session: Imaging of Inflammatory Bowel Disease: If There Was Only One Choice—What Would It Be? CT or MR Enterography?

Thursday, 07:15 AM - 08:15 AM • E351

SPSC50 • AMA PRA Category 1 Credit ™:1 • ARRT Category A+ Credit:1
Moderator
Joel G Fletcher, MD *

SPSC50A • The Argument for CT Enterography
Joel G Fletcher MD (Presenter) *

LEARNING OBJECTIVES
1) To review the medical justification and appropriateness of CT enterography for Crohn’s disease diagnosis and staging. 2) To understand the natural history of Crohn’s disease and the relationship between patient symptoms and biologic activity. 3) To discuss methods for performing CT enterography for Crohn’s disease, and how the technique can be adapted for different patients. 4) To briefly review the imaging findings of Crohn’s disease at CT enterography. 5) To understand the risks of CT enterography. 6) To discuss integration of CT enterography with other tests that diagnose and stage Crohn’s disease (e.g., ileocolonoscopy, capsule endoscopy, MR enterography, flouroscopy). 7) To discuss relative merits of CT enterography in comparison to MR enterography.

SPSC50B • The Argument for MR Enterography
David J Grand MD (Presenter)

LEARNING OBJECTIVES
1) To review the appropriateness of MR enterography for Crohn’s disease diagnosis and staging. 2) To discuss the technical aspects unique to MR Enterography. 3) To briefly review the imaging findings of Crohn’s disease at MR enterography. 4) To discuss the relative merits of MR enterography in comparison to CT enterography.

ABSTRACT
CT and MR Enterography have become the most common imaging modalities used to evaluate inflammatory bowel disease. This presentation will discuss technical aspects of how to perform each exam as well as when to perform which exam. It will also demonstrate a simple, yet comprehensive approach to each study with special attention to common findings and complications of inflammatory bowel disease.

MSESS51 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5

MSESS51A • Imaging of Inflammatory Bowel Disease
David J Grand MD (Presenter)

LEARNING OBJECTIVES
1) Understanding the role of enterography for imaging of inflammatory bowel disease. 2) Understand how to protocol and perform CT and MR Enterography examinations. 3) Understand the considerations involved in choosing which exam to perform. 4) Identify the findings and complications of inflammatory bowel disease on CT and MR Enterography.

ABSTRACT
CT and MR Enterography have become the most common imaging modalities used to evaluate inflammatory bowel disease. This presentation will discuss technical aspects of how to perform each exam as well as when to perform which exam. It will also demonstrate a simple, yet comprehensive approach to each study with special attention to common findings and complications of inflammatory bowel disease.

MSESS51B • Multimodality Imaging and Management of Cystic Pancreatic Lesions
Koenraad J Mortele MD (Presenter)

LEARNING OBJECTIVES
1) To review the spectrum of cystic pancreatic tumors of the pancreas. 2) To review the multi-modality imaging pearls and perils to diagnose and differentiate cystic pancreatic tumors. 3) To review management guidelines for cystic pancreatic tumors.

ABSTRACT
Cystic pancreatic neoplasms are a diverse group of tumors which vary in aggressiveness from benign to dysplastic or pre-malignant to frankly invasive cancers. The true prevalence of pancreatic cystic lesions is unknown but has been previously reported to be between 2.4% and 25%. At the author’s institution, Lee reported the prevalence of incidental pancreatic cystic lesions detected on MRI to be 13.5% and showed that both prevalence and cyst size increased with age. Since most cystic pancreatic lesions are neoplastic, accurate diagnosis via a combination of clinical information, imaging, and endoscopic ultrasound (EUS) with cyst fluid analysis is of utmost importance. The primary purpose of this review is to highlight the key imaging findings for a vast array of cystic pancreatic neoplasms. These include the relatively common ones: intraductal papillary mucinous neoplasm (IPMN), serous microcystic adenoma, and mucinous cystic neoplasm (MCN). Secondly, the radiological features of more rare ones, including cystic endocrine tumors, solid pseudopapillary tumor (SPT), cystic metastases, and lymphangiomata, will also be discussed. Finally, this article also provides a comprehensive management algorithm based on lesion size and patient’s symptoms, with recommendations when to reimage patients with those lesions.
LEARNING OBJECTIVES
1) Understand how to optimize the radiation dose of abdominal CT protocols applying technical advances. 2) Understand how to optimize the contrast media injection protocol for different abdominal CT protocols. 3) Understand how to optimize abdominal CT protocols in obese patients.

ABSTRACT
Although CT is a powerful tool that has transformed the practice of medicine, the benefits are accompanied by important risks. Radiologists must understand these risks and the strategies available to minimize them as well as the risks associated with contrast medium delivery in abdominal CT. This presentation will address many of the issues that are related to ensuring patient benefit in abdominal CT, balancing the use of ionizing radiation and iodinated contrast media.

The Acute Abdomen and Pelvis (An Interactive Session)

Thursday, 08:30 AM - 10:00 AM  ●  E450A

RC608  ●  AMA PRA Category 1 Credit ™:1.5  ●  ARRT Category A+ Credit:1.5

RC608A  ●  Imaging of Acute Pancreatitis: Current Concepts

Jorge A Soto MD (Presenter) *

LEARNING OBJECTIVES
1) To review the appropriate terminology that should be implemented when describing glandular and peri-glandular findings in acute pancreatitis, following the revision of the Atlanta classification. 2) To identify the importance of glandular necrosis in defining the prognosis of acute pancreatitis. 3) To describe the technical aspects that are necessary for acquiring good quality CT examinations in acute pancreatitis. 4) Illustrate specific situations where MR can be a valuable tool in the evaluation of acute pancreatitis.

RC608B  ●  Non-contrast CT of the Acute Abdomen

Douglas S Katz MD (Presenter)

LEARNING OBJECTIVES
1) To review the current indications for performing non-contrast CT of the acute abdomen and pelvis. 2) To demonstrate examples of non-contrast CT of the acute abdomen and pelvis, compared with other CT protocols/other cross-sectional imaging examinations. 3) To briefly review areas of controversy with CT protocols (e.g. appendicitis).

Gastrointestinal: CT Colonography Update (An Interactive Session)

Thursday, 08:30 AM - 10:00 AM  ●  E353C

RC609  ●  AMA PRA Category 1 Credit ™:1.5  ●  ARRT Category A+ Credit:1.5

RC609A  ●  CT Colonography: Techniques

Seong Ho Park MD (Presenter) *

LEARNING OBJECTIVES
1) Understand the basic bowel preparation steps for CT colonography and related knowledge updates. 2) Design and modify their bowel preparation procedures for CT colonography practice. 3) Explain the procedures during the scanning of CT colonography. 4) Understand the radiation dose of CT colonography and how to reduce it. 5) Identify common pitfalls related to CT colonography techniques and how to avoid them.

RC609B  ●  CT Colonography: Interpretation Workflow

Abraham H Dachman MD (Presenter) *

LEARNING OBJECTIVES
1) Improve knowledge of CTC interpretation workflow. 2) Apply principles to utilize 2D, 3D and novel presentations of CTC data. 3) Avoid some common pitfalls in CTC interpretation.

RC609C  ●  CT of the Acute Female Pelvis

Anjali Agrawal MD (Presenter)

LEARNING OBJECTIVES
1) Highlight the importance of recognition of acute gynecologic conditions on CT. 2) Outline the physiologic processes that may present as acute pelvic pain and their CT findings. 3) Describe the CT features of common pathologic causes of acute female pelvis. 4) Illustrative case examples with correlative imaging findings on sonography or MRI to improve the understanding of the anatomy and pathology on CT.

ABSTRACT
This portion of the session will cover CTC workflow and explain:
- The environment for interpretation.
- How to perform quality assurance of CTC images
- Review common strategies of interpretation
- Discuss generating a CTC report.
- Interpretation workflow:
  1. Confirm segmentation and map out colon
  2. 3D transparency view or coronals
  3. Quality assurance
4. Distention, stool, fluid, tagging
5. Search for polyps using both 3D and 2D
6. Characterize and measure polyp candidates
7. Secondary CAD-assisted evaluation
8. Report (follow C-RADS guidelines)
9. Search for extracolonic findings
10. Q.A. CHECKLIST
Location of segments
Tortuosity, mobility when comparing supine to prone
Identify ileocecal valve
Quality of distention
Retained stool: Size, tagging
Retained fluid: Quantity, location, tagging, change supine → prone
Artifacts (e.g., metal, breathing)

METHODS OF INTERPRETATION:
3D with 2D problem solving
2D with 3D problem solving
Soft tissue windows for flat lesions
Bone windows for dense oral contrast tagged fluid and stool
Virtual Pathology (open views)

Computer-aided diagnosis (CAD) APPROACH TO POLYP CANDIDATE ANALYSIS:
Polyp vs. fold > use > 3D or MPRs
Polyp vs. stool > use > texture (W/L or color map)
If solid . . . Compare supine / prone for mobility
If mobile, check for long stalk, colonic rotation / flip

PRIMARY 3D READ STRATEGIES:
Forward and backward
Supine and prone
Special software features (e.g., color map for polyp characterization, show blind areas)
Problem solve in 2D as needed as you read

Bookmark and defer difficult problem solving (e.g., difficult supine/prone comparison)

STRUCTURED REPORT:
History
Prep
Informed of exam limitations
Technique
Colon findings
Extracolonic findings
C-RADS scores / Recommendations
Footnote qualifier / reference C-RADS

RC609C • CT Colonography: Errors to Avoid

Judy Yee MD (Presenter) *

LEARNING OBJECTIVES
1) To understand the most common causes of false positives on CT Colonography. 2) To learn problem solving strategies to avoid missed lesions and false positives. 3) To streamline time-efficient interpretation methodology with high accuracy for lesion detection.

ABSTRACT
Accurate interpretation of CT Colonography requires specific education. Readers must learn the appearance of normal structures and pitfalls in order to avoid errors of interpretation. There are different learning paradigms depending upon the technique employed such as with the use of tagging and computer aided detection. Maintenance of competency in this area requires continued learning and experience.

RC609D • CT Colonography: Summary of Results

David H Kim MD (Presenter) *

LEARNING OBJECTIVES
1) Be knowledgeable of the major trials establishing CTC performance. 2) Understand the strengths and weaknesses of CTC- and OC-based screening. 3) Be aware of the likely risk estimates from radiation in CTC-based screening.

Abdominal Vasculature: Ultrasound and Doppler

Thursday, 08:30 AM - 10:00 AM • S103CD

RC610A • Liver Doppler

Kathryn A Robinson MD (Presenter)

LEARNING OBJECTIVES
1) Identify normal hepatic hemodynamics. 2) Identify hemodynamic alterations in portal hypertension. 3) Identify portal and hepatic vein thrombosis. 4) Identify normal sonographic and Doppler findings as well as complications of Transjugular Intrahepatic Portosystemic Shunt (TIPS).

ABSTRACT

RC610B • Contrast Ultrasound in the Abdomen

Hans-Peter Weskott MD (Presenter) *

LEARNING OBJECTIVES
1) Understanding the indications of contrast enhanced ultrasound (CEUS) in different abdominal organs. 2) Learning about the importance of the three contrast phases and how CEUS performs in detecting and characterizing focal liver lesions. 3) Learning the potential value as well as the limitations of CEUS in renal disorders. 4) Learning how CEUS performs in diseases of other solid organs including the intestine and major abdominal vessels.

ABSTRACT
Liver: In patients with favorable scanning conditions CEUS is at least as sensitive as contrast enhanced CT (CECT) in detecting malignant liver lesions. Due to a high temporal resolution, even a short hyper-enhancement of a few seconds can reliably be detected, thus
improving the characterization of focal liver lesions. A majority of malignant lesions can therefore be characterized as iso- or hyper-enhancing. During the arterial phase the tumor’s vessel architecture and direction of contrast filling is important for characterizing a lesion’s character. Due to a high spatial resolution, novel contrast imaging techniques allow detection of washed out lesions down to 3mm in size. CEUS characterizes focal liver lesions with a much higher diagnostic confidence than conventional US and is comparable to CT and MRI. CEUS also improves intraoperative tumor detection and characterization. Using time intensity analysis a change in contrast enhancement and kinetics helps in estimating tumor response to chemotherapy. CEUS is also used to monitor local ablation therapy and is a useful imaging tool to detect early tumor recurrence. Gallbladder: CEUS can be used to better visualize ulceration, perforation, and tumors of its wall. Pancreas: CEUS can be used to reliably image necrosis in acute pancreatitis. It helps to differentiate neuroendocrine tumors from ductal adenocarcinoma. Kidney: CEUS adds great value in detecting and characterizing complicated cysts and is believed to be more accurate than CECT. However, its value in differentiating solid renal tumors is limited. Parenchymal changes due to infectious diseases can be diagnosed by using CEUS. It is highly sensitive in detecting organ infarctions as well. Intestine: CEUS is of great value in characterizing inflammatory diseases and especially in imaging complications. CEUS improves visualization of abdominal vascular disorders

**RC610C ● Aorta and Its Branches**

*Mary C Frates MD (Presenter)*

**LEARNING OBJECTIVES**

1) Understand the gray scale and Doppler techniques useful for evaluating the aorta and its branches. 2) Recognize the presence of vascular stenosis, aneurysm and malformations. 3) Understand the challenges in the sonographic evaluation of aortic stent grafts.

**ABSTRACT**

**Tumor Ablation beyond the Liver: How-to and Preliminary Results**

**Thursday, 08:30 AM - 10:00 AM ● S403A**

*Debra A Gervais, MD *

*Terrance Hedges, MD *

*Anil N Kurup, MD *

*Muneeb Ahmed, MD *

**LEARNING OBJECTIVES**

1) Gain knowledge as to how to approach tumor ablation in extrahepatic sites. 2) How to avoid and manage organ specific complications. 3) Review results of tumor ablation in the lung, kidney, and bone.

**ABSTRACT**

Pulmonary malignancies, and specifically lung cancer, are a leading cause of death worldwide. Utilization of best current therapies results in an overall five-year relative survival rate for all stages combined to be only 15%, necessitating the use of alternative therapies. Image-guided ablation of lung malignancies is a revolutionary concept whose clinical applications are just beginning to be developed. It has some advantages over traditional radiotherapy and chemotherapy. Its safety profile is similar to percutaneous image guided lung biopsy. Almost all image-guided ablative procedures can be performed without any additional risks. Contraindications are few and include uncontrollable bleeding diathesis and recent use of anticoagulants. Image-guided ablation of lung malignancies is performed with two basic rationales. In the first group it is used with an intention of achieving definitive therapy. These are patients who are not candidates for surgery because of co-morbid medical contraindications to surgery, like poor cardiopulmonary reserve or patients refusing to undergo operation. This cohort could potentially derive significant benefit from a minimally invasive alternative therapy. In the second group it is used as a palliative measure as follows: (a) to achieve tumor reduction before chemotherapy (b) to palliate local symptoms related to aggressive tumor growth, such as chest pain, chest wall pain or dyspnea (c) hematogenous painful bony metastatic disease (d) tumor recurrence in patients who are not suitable for repeat radiation therapy or surgery Image-guided ablation is expanding treatment options for the local control of non-small cell lung cancer and metastatic disease.

**Emergency Body MRI: Vascular Emergencies, Abdominal Emergencies and the Pregnant Patient (How-to Workshop)**

**Thursday, 08:30 AM - 10:00 AM ● E261**

Christine O Menias, MD

Constantine A Raptis, MD

Vamsi R Narra, MD,FRCR *

**LEARNING OBJECTIVES**

1) Review the role of MRI as a primary diagnostic modality for evaluation of acute abdominal and pelvic pathologies. 2) Describe the gray scale and Doppler techniques useful for evaluating vascular emergencies, abdominal emergencies and the evaluation of an acute abdomen in a pregnant patient. 3) Case examples of pertinent entities of Acute abdomen on MRI will be reviewed.

**ABSTRACT**

Magnetic resonance imaging (MRI) is now more readily available in the emergency room setting and is becoming the primary modality used to diagnose acute abdominal pathologies in situations where there may be relative contraindications to computed tomography (CT). A review by MRI of various acute abdominal conditions is presented. The future directions of MRI in evaluating patients with abdominal emergencies are also briefly discussed.

Review the MRI features of Acute Hepatic and Biliary entities such as Cholelithiasis, cholecystitis cholangitis, Hepatic abscess and Mirizzi syndrome MRI features of acute pancreatitis and complications such as necrotizing, hemorrhagic and pseudocystic. Review the MRI imaging features of acute Genitourinary entities such as renal abscess, pyonephrosis and obstructing ureteral stone Acute Gyn entities include MRI imaging of PID, ovarian torsion, hematocoles, and ruptured hemorrhagic cyst Review the Acute gastrointestinal disorders on MRI such as SBÖ, mesenteric arterial and venous ischemia crohns, colitis, and Peptic ulcer disease

**Emergency Radiology (Imaging Abdominal Emergencies)**

**Thursday, 10:30 AM - 12:00 PM ● N226**

Muneeb Ahmed, MD

Terrance T Healey, MD

Debra A Gervais, MD *

**ABSTRACT**

1) Review results of tumor ablation in the lung, kidney, and bone. 2) How to approach tumor ablation in extrahepatic sites. 3) Case examples of pertinent entities of Acute abdomen on MRI will be reviewed.

**Emergency Radiology (Imaging Abdominal Emergencies)**

**Thursday, 10:30 AM - 12:00 PM ● N226**

Muneeb Ahmed, MD

Terrance T Healey, MD

Debra A Gervais, MD *

**ABSTRACT**

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Magnetic resonance imaging (MRI) is now more readily available in the emergency room setting and is becoming the primary modality used to diagnose acute abdominal pathologies in situations where there may be relative contraindications to computed tomography (CT). A review by MRI of various acute abdominal conditions is presented. The future directions of MRI in evaluating patients with abdominal emergencies are also briefly discussed.

Review the MRI features of Acute Hepatic and Biliary entities such as Cholelithiasis, cholecystitis cholangitis, Hepatic abscess and Mirizzi syndrome MRI features of acute pancreatitis and complications such as necrotizing, hemorrhagic and pseudocystic. Review the MRI imaging features of acute Genitourinary entities such as renal abscess, pyonephrosis and obstructing ureteral stone Acute Gyn entities include MRI imaging of PID, ovarian torsion, hematocoles, and ruptured hemorrhagic cyst Review the Acute gastrointestinal disorders on MRI such as SBÖ, mesenteric arterial and venous ischemia crohns, colitis, and Peptic ulcer disease
SSQ05-01 • Sonography of the Borderline Appendix: A Closer Look
Jason D Oppenheimer MD (Presenter) ; Rupesh H Kalthia MD ; Eric W Olcott MD ; R. Brooke Jeffrey MD *

PURPOSE
Some authorities diagnose appendicitis on ultrasound with an outer diameter criterion of >6 mm while others use a criterion of >7 mm. We evaluated the potential utility of secondary findings including hyperemia and hyperechoic fat in the diagnosis of patients whose appendices measured between 6 and 7 mm and thus were considered borderline by size criteria.

METHOD AND MATERIALS
We retrospectively reviewed 3,506 consecutive ultrasound examinations for suspected appendicitis in patients who presented to the emergency department at a tertiary care center over a 5-year period, with HIPAA and IRB compliance. Three radiologists blinded to final diagnoses identified 98 sonograms with non-compressible 6 to 7 mm diameter appendices and evaluated them for secondary findings of appendicitis including hyperemia, hyperechoic fat, loss of the submucosal layer echo, periappendiceal fluid and appendicoliths. Hyperechoic fat was deﬁned as increased periappendiceal echogenicity greater than 1 cm in diameter. Fisher’s exact test and linear regression were used to compare secondary ﬁndings with final diagnoses made by surgical pathologic examination.

RESULTS
From 2007-2012, 98 ultrasounds demonstrated appendices with diameters between 6 and 7 mm of which only 51 (52%) had appendicitis by surgical pathologic examination. Of the secondary signs in the 98 patients, hyperechoic fat had the highest individual positive predictive value and speciﬁcity for appendicitis (78% and 83%, respectively), which increased with the addition of hyperemia to 80% and 89%, respectively. Statistical modeling showed a linear direct correlation between the number of secondary signs present and both positive predictive value and speciﬁcity (R²=0.963 and R²=0.949, respectively), values that increased to 100% in the presence of four secondary signs.

CONCLUSION
Hyperechoic fat and hyperemia increase the positive predictive value and speciﬁcity of sonography for appendicitis in patients with noncompressible appendices of diameters between 6 and 7 mm. Without secondary signs, a conservative approach should be followed as approximately half of such patients with borderline diameter appendices do not have appendicitis.

CLINICAL RELEVANCE/APPLICATION
Ultrasound reliably predicts appendicitis in borderline 6 to 7 mm diameter appendices when secondary characteristics are assessed.

SSQ05-02 • Does Inclusion of Imaging in the Work Up of Patients with Clinically Suspected Appendicitis Reduce the Rate of Unnecessary Surgical Procedures?
Max Lahaye MD, PhD (Presenter) ; Doenja M Lambregts MD, PhD ; Eveline Mutsaers ; Alfons Kessels ; Stephanie Breukink ; Regina G Beets-Tan MD, PhD

PURPOSE
Since February 2010 new Dutch guidelines have been implemented recommending the use of US or CT to confirm or refute clinically suspected appendicitis before (laparoscopic) surgery. For equivocal cases with US additional imaging (CT/MRI) is recommended. This study aimed to see whether these new guidelines lowered the percentage appendix sana.

METHOD AND MATERIALS
This retrospective study included all consecutive patients operated for clinically suspected appendicitis at our hospital from 2006 until 2013. The use of imaging (none versus US, CT and/or MRI) and its findings were recorded. Surgical and histopathological findings—where available—were noted. The primary study endpoint was the number of appendix sana before and after the guideline implementation.

RESULTS
745 patients were included, of which 475 were collected before the implementation of the guidelines and 270 after. During the pre-implementation period, 22.3% (106/475) of the patients received imaging focussed on the appendix. Post-implementation, 98.9% (267/270) of the patients received imaging before surgery. The average percentage of an appendix sana before the guidelines was 25% (119/475). After implementation, this average percentage dropped significantly to 5.9% (16/270, p<0.001). From 2007-2012, 98 ultrasounds demonstrated appendices with diameters between 6 and 7 mm of which only 51 (52%) had appendicitis by surgical pathologic examination. Of the secondary signs in the 98 patients, hyperechoic fat had the highest individual positive predictive value and specificity for appendicitis (78% and 83%, respectively), which increased with the addition of hyperemia to 80% and 89%, respectively. Statistical modeling showed a linear direct correlation between the number of secondary signs present and both positive predictive value and specificity (R²=0.963 and R²=0.949, respectively), values that increased to 100% in the presence of four secondary signs.

CONCLUSION
Use of preoperative imaging in all patients with suspected clinically appendicitis resulted in a significant reduction in the percentage of appendix sana. This suggests that the implementation of imaging in the work up of these patients could be an effective strategy to reduce the number of unnecessary surgeries.

CLINICAL RELEVANCE/APPLICATION
Preoperative imaging results in a significant reduction of unnecessary surgery and should thus be recommended for all patients clinically suspected for appendicitis.

SSQ05-03 • The Alvarado Score as a Method for Potentially Reducing the Number of Unnecessary CT Scans for Appendicitis When Appendiceal Ultrasound Fails to Visualize the Appendix
Robert Jones MD (Presenter) ; R. Brooke Jeffrey MD * ; Terry S Desser MD * ; Eric W Olcott MD

PURPOSE
To evaluate the Alvarado score as a means to reduce referrals to CT when ultrasound fails to visualize the appendix but is otherwise normal.

METHOD AND MATERIALS
With IRB and HIPAA compliance, 1241 consecutive appendiceal sonograms for suspected appendicitis were reviewed to yield 247 patients whose studies did not visualize the appendix but were otherwise normal and had CT within 48 hours. Of the 247 patients, 86 had Alvarado scores of 3 or less.

RESULTS
The incidence of appendicitis was 15.4% (38/247) for all 247 patients but less among the 86 with Alvarado scores of 3 or less, whether considered normal 86 (2/86, 2.3%; p=0.001), females (0/59, 0%; P

CONCLUSION
Patients with non-visualization of the appendix and an Alvarado score of 3 or less are at particularly low risk for acute appendicitis and low risk for disorders requiring emergent surgery. Active clinical observation should be considered for them rather than direct referral to CT.

CLINICAL RELEVANCE/APPLICATION
Patients with non-visualization of the appendix but an otherwise normal ultrasound and an Alvarado score of 3 or less should be considered for active clinical observation rather than direct CT.

SSQ05-04 • Diagnosing Acute Appendicitis Using a Non-oral Contrast CT Protocol in Patients with a BMI of Less than 25
Vijay Ramalingam MD (Presenter) ; Jennifer W Uyeda MD ; David D Bates MD ; Kathy Zhao ; Marisa Roberts ; Lindsey Storer ; Jorge A Soto MD * ; Stephan W Anderson MD

PURPOSE
Evaluate the diagnostic accuracy and repeat CT scan rate for the diagnosis of appendicitis after the implementation of a non-oral contrast protocol in the Emergency Department setting in patients with a BMI of less than 25.

This retrospective study included all consecutive patients operated for clinically suspected appendicitis at our hospital from 2006 until 2013. The use of imaging (none versus US, CT and/or MRI) and its findings were recorded. Surgical and histopathological findings—where available—were noted. The primary study endpoint was the number of appendix sana before and after the guideline implementation.

RESULTS
745 patients were included, of which 475 were collected before the implementation of the guidelines and 270 after. During the pre-implementation period, 22.3% (106/475) of the patients received imaging focussed on the appendix. Post-implementation, 98.9% (267/270) of the patients received imaging before surgery. The average percentage of an appendix sana before the guidelines was 25% (119/475). After implementation, this average percentage dropped significantly to 5.9% (16/270, p<0.001).
METHOD AND MATERIALS
This IRB approved study included 736 adult patients with a BMI of less than 25 over two 6 month time periods (August 2012- January 2013 and June 2008- November 2008) presenting to the ED with acute abdominal pain and a clinical suspicion of acute appendicitis. The earlier cohort underwent CT imaging with oral and intravenous contrast, per departmental protocol. The later cohort was imaged solely with intravenous contrast, per a modified departmental protocol. The electronic medical record was reviewed, recording the results of imaging reports, clinical outcomes, and surgical pathology results.

RESULTS
A total of 364 patients received a CT scan with the use of oral and intravenous contrast; there were 40 true positive cases of appendicitis and 1 false positive case. The sensitivity, specificity, PPV, and NPV for the diagnosis of appendicitis with both oral and intravenous contrast was 100 %, 99.7 %, 99.6 %, and 100 %, respectively. A total of 372 patients received the non-oral contrast, positive intravenous contrast protocol; there were 39 true positive cases of appendicitis and 1 false positive case of appendicitis resulting in a sensitivity, specificity, PPV, and NPV of 100 %, 99.7 %, 97.5 %, and 100 %, respectively. One scan was repeated with the use of oral contrast due to inadequate visualization of the appendix which was subsequently found to be negative for appendicitis.

CONCLUSION
Implementation of a non-oral contrast CT protocol in patients with a BMI of less than 25 demonstrates similar accuracy to a positive oral contrast protocol in patients with a BMI of less than 25 for the diagnosis of appendicitis.

CLINICAL RELEVANCE/APPLICATION
As ordering clinicians and emergency departments continue to seek ways to increase throughput, the continuing use of oral contrast in patients with smaller BMIs may no longer be needed.

SSQ05-05 • Improving the Role of CT in Diagnosing Complicated Appendicitis: Are there Occult Signs?
Mustafa Al Sultan MD (Presenter) ; Tarek Hegazi MBBS ; Caroline Reinhold MD, MSc ; Lawrence A Stein MD

PURPOSE
Retrospectively evaluate the accuracy of focal appendiceal wall enhancing defect and intra-luminal gas in predicting gangrenous and / or perforated appendicitis when not apparent on imaging in relation to surgical and pathological results.

METHOD AND MATERIALS
Patients with surgical / pathology-proven appendicities who underwent preoperative IV contrast CT within 24 hours of surgical intervention over a 4-year period (n=187) were retrospectively reviewed. Variable clinical data and length of admission for each patient were also assessed. Two radiologists who were blinded from the clinical data and final surgical / pathology results assessed each scan for: diameter of appendix, enhancing wall defect, and intra-luminal gas. The results were compared against surgical and pathology findings and divided into 3 groups (perforated, gangrenous and simple). The perforated group was subsequently divided into 2 subgroups whether there was presence or absence of classic CT findings of perforated hollow viscous (i.e either / or abscess, extra-luminal gas, or extra-luminal appendicolith). Statistical significance, sensitivity and specificity for each finding were calculated. Interobserver agreement using kappa index was used for focal enhancing wall defect.

RESULTS
Simple, gangrenous and perforated appendicitis were present in 65.8%, 16% and 18.2% of the study cohort respectively. There was a good interobserver agreement (kappa = 0.78) for focal wall enhancing defect. Sensitivity and specificity of focal wall defect for diagnosing perforated appendicitis was 81.8% and 92.8% respectively, PPV = 71.0%, NPV = 95.9%. Sensitivity and specificity for Intra-luminal gas was 45.3 % and 91.1% respectively, PPV = 72.5%, NPV = 76.2%.

CONCLUSION
Classic CT signs have been well-documented for diagnosis of perforated appendicitis, however, recognition of occult signs, as focal enhancing wall defect or intra-luminal gas in otherwise uncomplicated appendicitis at imaging increases suspicion of suggesting a perforated or gangrenous acute appendicitis.

CLINICAL RELEVANCE/APPLICATION
Focal wall defect and intra-luminal gas add more sensitive interpretation value in the diagnosis of image-occult complicated appendicitis and is recommended in routine evaluation of these cases.

SSQ05-06 • Low-tube-voltage High-pitch Dual-source Computed Tomography with Sonogram Affirmed Iterative Reconstruction Algorithm of the Abdomen and Pelvis: Initial Clinical Experience
Hao Sun MD (Presenter) ; Huadan Xue MD ; Zhengyu Jin MD ; Xuan Wang MD ; Yu Chen MD ; Yonglan He MD

PURPOSE
To investigate the image quality, radiation dose and diagnostic performance of the low-tube-voltage high-pitch dual-source computer tomography (DSCT) with sonogram affirmed iterative reconstruction (SAFIRE) for routine abdominal and pelvic scans.

METHOD AND MATERIALS
This institutional review board-approved prospective study included 64 patients who gave written informed consent for acquisition of additional abdominal and pelvic images on DSCT. The patients underwent standard CT scans (protocol 1) (tube voltage of 120kVp/pitch of 0.9/ filter back projection [FBP] reconstruction) followed by high-pitch CT scans (protocol 2) (100kVp/3.0/SAFIRE). The total scan time, mean CT number, signal to noise ratio (SNR), image quality, lesion detectability and radiation dose were compared between two protocols.

RESULTS
The total scan time of protocol 2 was less than that of protocol 1 (P 0.05). SNR on images of protocol 2 was higher than that of protocol 1 (all P)

CONCLUSION
The high-pitch DSCT with SAFIRE can reduce scan time and radiation dose while preserving image quality in abdominal and pelvic scans.

CLINICAL RELEVANCE/APPLICATION
The low-tube-voltage high-pitch DSCT with SAFIRE preserves good image quality, less scan time and radiation dose in routine abdominal and pelvic scans, especially useful in emergent patients.

SSQ05-07 • Simple or Solid? Prospective Clinical Evaluation of Iterative Reconstruction Using Dual-source Single-detector Reconstruction to Compare Renal Cyst Density on 50% Dose Images
Kristy Lee MD (Presenter) ; Patrick McLaughlin FFRRCSI ; Rekha Raju ; Shamir Rai BSC ; Sarah A Barrett MBCh ; Charlotte J Yong-Hing MD, FRCP ; Alison C Harris MBChB ; John R Mayo MD * ; Savvas Nicolaou MD

PURPOSE
Many studies now demonstrate the utility of iterative reconstruction (IR) algorithms to generate acceptable abdominal CT images at lower radiation exposures than filtered back projection (FBP). In comparison there is a clear deficiency robust clinical studies examining the change in a appearance, density and conspicuity of pathology on low dose CT reconstructed with FBP and IR. The purpose of this study was to determine if the internal characteristics of renal hypodensities differed between 100% and 50% dose images generated using a dual source imaging protocol using FBP and IR.

METHOD AND MATERIALS
This study compares renal cortical density on 50% dose images generated with the use of iterative reconstruction (IR) to the cortical density on 100% dose images generated with the use of filtered back projection (FBP) in patients with renal masses. 

RESULTS
The cortical density was measured on a scale of 0-100 with 0 being the least dense and 100 being the most dense. The mean cortical density of the 50% dose images was 72.3 ± 13.4 and the mean cortical density of the 100% dose images was 67.2 ± 12.9. The difference in cortical density between the 50% and 100% dose images was statistically significant (P < 0.05). 

CONCLUSION
The cortical density on 50% dose images generated with the use of IR is significantly different from the cortical density on 100% dose images generated with the use of FBP. This finding supports the use of IR for low dose CT imaging.
SSQ05-08 • Frequency of Previously Reported Ovarian Torsion Findings on Both Ultrasound and Computed Tomography

David W Swenson MD (Presenter); Ana P Lourenco MD; David J Grand MD

PURPOSE
Evaluate the frequency of imaging findings for ovarian torsion on ultrasound (US) and computed tomography (CT) studies performed in the emergency department (ED).

METHOD AND MATERIALS
20 adult females with surgically proven ovarian torsion underwent both pelvic US and CT between 3/1/2006 and 5/31/2010. Two radiologists reviewed all US and CT studies in consensus, measuring each torse ovary in 3 axes, and grading each study for the presence or absence of the following previously described findings of torsion: (1) ovarian width >5cm, (2) ovarian volume > 20 mL, (3) ovarian stromal edema/heterogeneity, (4) numerous small peripheral follicles, (5) a twisted vascular pedicle or swirl sign, (6) small free fluid in the pelvis, (7) abnormal Doppler waveforms (US only), (8) para-ovarian fatty stranding (CT only), and (9) uterine deviation toward the torse ovary.

RESULTS
Of the 20 torse ovaries, 55% were on the right and 45% on the left. An underlying mass was identified in 60%. Mean torse ovarian diameter was 7.4 cm (range, 5.0-20.0 cm). Mean volume was 416 mL (range, 29-1842 mL). Thus 100% of torse ovaries met previously published size criteria for concern, namely a single measurement >5 cm, and volume > 20 mL. Stromal edema/heterogeneity was identified in 40% of torse ovaries by US (vs. 60% on CT), peripheral follicles in 40% by US (vs. 5% on CT), a twisted vascular pedicle in 10% by US (vs. 60% on CT), small free fluid in 55% by US (vs 45% on CT), and abnormal Doppler waveforms in 40% by US (vs. NA for CT). Para-ovarian fatty stranding and uterine deviation towards the torse ovary were each present on 40% of CT studies.

CONCLUSION
An abnormally enlarged ovary is the most common finding of ovarian torsion on both US and CT. While US is often considered the optimal imaging modality for identifying torsion, in our series, CT was equal to or more successful than US in demonstrating most of the previously reported ancillary findings of torsion.

CLINICAL RELEVANCE/APPLICATION
Pelvic US is often described as the best imaging modality for evaluating ovarian torsion, however, CT may provide comparable diagnostic value and may be underappreciated in this regard.

SSQ05-09 • Diagnosing Acute Pancreatitis Using Attenuation Values in Patients with Unexplained Abdominal Pain, Apparently Normal CT Scans and Normal Serum Levels of Pancreatic Enzymes

Mahmood A Al Bahar MD (Presenter); Soumia Senouci; Puskar Pattanayak MBBS, FRCR; Caroline Reinhold MD, MSc

PURPOSE
To evaluate the ability of pancreas CT attenuation values to diagnose acute pancreatitis in patients presenting with abdominal pain, normal serum levels of pancreatic enzymes, and no apparent CT scan finding to explain the patients' pain.

METHOD AND MATERIALS
Out of 124 patients reviewed, 31 patients satisfied the inclusion criteria, including documented clinical suspicious of pancreatitis, three fold elevation of pancreatic enzymes and grade A or B pancreatitis by CT scan. Another 31 normal CT scans for trauma were included in the control group. The attenuation values, measured in Hounsfield Units (H.U), of the spleen, aorta, portal vein and head, body and tail of the pancreas were measured in both arterial and portovenous phases for both cases and control groups. The threshold of the pancreatic attenuation and the pancreatic-splenic attenuation ratios for predicting acute pancreatitis were assessed with receiver operating characteristic curve analysis.

RESULTS
In both arterial and portovenous phases, there was statistically significant differences between the cases and control groups in regards to the attenuation values of the head and body of the pancreas. No such difference was seen in the tail. The mean HU of the pancreas was 76.04 HU in cases of pancreatitis, whereas in control cases it was 86.47 HU (p=0.05) ON PV phase. When considering the ratio between the pancreas and the spleen, the mean was 0.77 for patients and 0.88 for controls (p=0.02). A pancreatic-splenic ratio of 0.77 in the portovenous phase has a 76% positive predictive value (PPV) in diagnosing acute pancreatitis with a 85% specificity.

CONCLUSION
Our study demonstrates that when a patient presents with abdominal pain, normal pancreatic enzymes and no CT findings to explain the patients' pain, a pancreatic-splenic attenuation ratio in the portovenous phase of 0.77 has a 76% PPV with a 85% specificity for diagnosis acute pancreatitis. These findings may allow a diagnosis of acute pancreatitis to be made in cases were early clinical and morphological imaging findings are non-diagnostic. This will help explain the cause of abdominal pain in some of patients and reduce the number of negative emergency CT scans.

CLINICAL RELEVANCE/APPLICATION
This finding may allow a diagnosis of acute pancreatitis to be made where early clinical, laboratory and morphological imaging findings are non-diagnostic, which could explain patient's symptoms.
Diffusion-weighted MR Enterography for Evaluating Crohn’s Disease Activity: A Blinded Prospective Study of Global Patient Assessment of Crohn’s Disease Severity: Is MaRIA Sufficient, or Does Length of Enteric Inflammation Matter?

Benjamin D Spilseth MD (Presenter) ; Jeff L Fidler MD * ; David Bruining MD * ; Stephanie Hansel MD * ; William S Harmsen JD ; Jordi Rimola MD ; David R Holmes PhD ; Alan Larson ; Shiv Pruthi ; Joel G Fletcher MD *

PURPOSE
The MaRIA score (MR Index of Activity) is a validated method for measuring the severity of Crohn’s disease enteric inflammation that is gaining widespread acceptance in the GI community, but does not take into account the length of enteric inflammation, which greatly impacts patient function and disability. The purpose of our study was to determine if length of enteric inflammation improves the prediction of global and clinical Crohn’s disease severity scores compared to MaRIA alone.

METHOD AND MATERIALS
30 patients with known Crohn’s disease underwent MR enterography within 30 days of ileocolonoscopy. Using a dedicated computer workstation, five colonic segments and three small bowel segments were systematically evaluated by two radiologists, who measured the MaRIA score and length of enteric inflammation using semi-automated tools for all inflamed bowel segments. A global physician score (GPS) of Crohn’s disease severity (ranging from 0–3) was created by a panel of gastroenterologists using ileocolonoscopy records, biopsy results, imaging reports, Harvey-Bradshaw index (HBI) scores, and C-reactive protein (CRP) was used as a reference standard.

RESULTS
For each reader, both MaRIA scores and lengths of enteric inflammation were significantly correlated with GPS (p < 0.0001), CRP (p < 0.0001), and ileocolonoscopy HBI scores. Excellent correlation exists between global and clinical markers of Crohn’s disease severity and MaRIA scores and measured lengths of enteric inflammation. Because MaRIA scores are highly correlated with length of enteric inflammation, neither was independently predictive of global physician score for both readers in this small cohort. In larger patient cohorts, incorporation of length measurement will likely be useful in a future quantitative model.

CONCLUSION
Both the MaRIA score and measured lengths of enteric inflammation are highly related quantitative measures that correlate well with global assessment of Crohn’s disease severity.

Diffusion-weighted MR Enterography for Evaluating Crohn’s Disease Activity: A Blinded Prospective Study of Diagnostic Performance Using Stratified Endoscopic Severity as the Reference Standard

Yedaun Lee MD (Presenter) ; Seong Ho Park MD * ; Kyung Jo Kim ; Bo-Kyong Kang MD ; So Yeon Kim ; Seung Soo Lee MD

PURPOSE
To prospectively determine the performance of diffusion-weighted (DW) MR enterography (MRE) for evaluating bowel inflammation of Crohn’s disease

METHOD AND MATERIALS
17 men and 5 women with Crohn’s disease (mean age, 29.5 years) underwent conventional contrast-enhanced (CE) MRE and DW-MRE at b=900 s/mm² on a 3T system and ileocolonoscopy as the reference standard within 1-week interval. For precise location-by-location match between MRE and endoscopy, the terminal ileum, cecum and ascending colon, and rectum were only analyzed. CE-MRE and DW-MRE were reviewed independently blinded to each other except that the bowel segments to evaluate were pre-marked on DW-MRE by a third person given the lack of anatomical details on DW images. Hyperintensity of the bowel wall on DW-MRE comparable to the signal of mesenteric lymph nodes or the spleen (in the absence of lymph nodes); and presence of mural hyperenhancement, strafication, or T2 hyperintensity, perienteric infiltration, or comb sign on CE-MRE were considered positive findings. Endoscopic findings were stratified into 4 groups: normal or healed lesion (i.e. inactive) and three degrees of bowel inflammation including erythema/edema only, aphthoid lesions only, and overt ulcers. The sensitivity and specificity of DW-MRE and CE-MRE were compared.

RESULTS
A total of 64 bowel segments (22 with ulcers, 14 with aphthoid lesions, 2 with erythema/edema, and 26 inactive) were included. DW-MRE sensitivity was 86.4% (19/22), 57.1% (8/14), and 0% (0/2) for ulcers; aphthoid lesions, and erythema/edema, respectively, while the sensitivity of CE-MRE was 90.9% (20/22), 14.3% (2/14), and 0% (0/2), respectively, demonstrating no significant difference for ulcers albeit higher sensitivity in DW-MRE for all active lesions (71.1% vs. 57.9%). DW-MRE specificity (46.2% [12/26]) was significantly lower compared with CE-MRE (100% [26/26]). False-positive DW-MRE results occurred mostly in the colon (13/14) and was largely associated with undistended bowel (11/14).

CONCLUSION
DW-MRE was more sensitive than CE-MRE for non-ulcerative active bowel lesions but was less specific for excluding active inflammation, generating a high rate of false positives presumably related to undistended bowel.
Motility changes in pre-stricture dilated bowel are fluid over time and different from normal bowel. As the bowel diameter decreases, motility increases and vice versa.
Gastrointestinal (Ablation and Abdominal Interventions)

Thursday, 10:30 AM - 12:00 PM • E350

SSQ07-09 • Comparison of Bismuth, Tungsten, and Tantalum Enteric Contrast Agents to Complement Iodine for Double Contrast Dual-energy CT Enterography

Samira Rathnayake (Presenter) ; John Mongan MD, PhD * ; Yanjun Fu PhD ; Andrew S Torres PhD * ; Dongwei Gao MD ; Margaret J Wong MENG, BS ; Wilbur Wang BA ; Benjamin M Yeh MD *

PURPOSE
To investigate the effectiveness of double contrast DECT obtained with iodinated intravenous and non-iodinated enteric contrast for small bowel wall and vasculature visualization, compared with conventional CT.

METHOD AND MATERIALS
Thirteen rabbits were imaged on a rapid kVp switching CT scanner with intravenous iohexol and an experimental positive enteric contrast agent: bismuth subsalicylate (n=5), tungsten oxide (n=4), or tantalum oxide (n=4). These enteric agents can be separated from iodine at DECT due to their relative high and low x-ray attenuation coefficients. DECT iodine-only density maps and conventional CT images were obtained from the thirteen studies to generate 94 pairs of small bowel and 34 pairs of vasculature image comparisons. Four sub-specialty trained abdominal imaging attending radiologists without prior DECT experience independently viewed each comparison to record relative clarity of small bowel wall and abdominopelvic vasculature and completeness of enteric contrast subtraction using a visual analog scale (0%=contrast materials not distinguished to 100%=perfect separation). Significance of differences was determined by t-tests.

RESULTS
Small bowel wall was observed to be 44% (95% CI: 34%-47%), p < 0.05.

CONCLUSION
Double contrast DECT provides better simultaneous visualization of bowel wall and vasculature than conventional CT in vivo. DECT iodine-only density maps obtained with a tungsten- or tantalum-based enteric contrast agent were clearer than with a bismuth-based enteric agent.

CLINICAL RELEVANCE/APPLICATION
Development of tantalum or tungsten enteric agents should enable clearer bowel wall and abdominopelvic vasculature visualization for double contrast DECT than conventional CT.

SSQ07-01 • Liver Cryoablation: Maximizing Outcomes with Minimal Morbidity

Hussein D Aoun MD (Presenter) ; Peter J Littrup MD * ; Barbara A Adam MSN ; Evan N Fletcher MS, BA ; Mark J Krycia BS

PURPOSE
To assess local recurrence and complication factors for liver cryoablation. Tumor and ablation volume, location, vessel proximity, and complications were assessed in primary and metastatic tumors using updated techniques. Focus upon hematologic complications was done to address prior bleeding fears.

METHOD AND MATERIALS
CT and/or CT-US fluoroscopic-guided percutaneous cryoablations were performed in 268 procedures on 357 tumors (59 primary hematomas and 298 metastatic carcinomas) in 176 patients, noting tumor and ablation volumes, abutting vessels >3mm, procedure complications and recurrences. Complications were graded by the National Institutes of Health, Common Terminology of Complications and Adverse Events (CTCAE). Stress dose(s) of steroids were used in more recent procedures (n=68), which also limited ablation volume per session. Patients received CT or MRI at 1, 3, 6, 12, 18, 24 months and yearly thereafter.

RESULTS
All patients required only conscious sedation. Ablation zones and tumors averaged 5.2 and 2.9 cm, respectively. A total local recurrence rate of 9.8% (35/357) was noted. Differences in local recurrence rates showed no significance based on tumor size or vessel proximity for metastatic or HCC tumors. Grade =3 complications were associated with larger ablation volumes (>100cc margin) in earlier procedures and before steroid prophylaxis. A total of 25% patients also had low hemoglobin or platelets blood values prior to procedure yet still resulted in only 11/268 (4.1%) grade =3 total complications, again early in our series.

CONCLUSION
CT guided percutaneous hepatic cryotherapy provides a low morbidity alternative, especially for more central and peripheral tumors, where cryoablation produces minimal biliary damage and pain, respectively. Complications =3 did not occur in patients with tumors of minimal risk. Appropriately delivered liver cryoablation, appears less susceptible to tumor size and peri-vascular location, with low recurrence rates, and now complication rates comparable to heat-based ablations.

SSQ07-02 • Fusion Imaging-guided Percutaneous Radiofrequency Ablation of Hepatocellular Carcinomas with Local Tumor Progression

Jihye Min MD (Presenter) ; Min Woo Lee ; Hyunchul Rhim MD, PhD ; Sanghyeok Lim MD ; Tae Wook Kang MD ; Kyoung Doo Song MD ; Seo-Youn Choi MD ; Hyo Keun Lim MD

PURPOSE
To assess whether fusion imaging of real-time ultrasonarograph (US) with liver CT/MR images for planning US of radiofrequency ablation (RFA) can improve conspicuity of lesions and reduce false positive detection of hepatocellular carcinomas (HCCs) with local tumor progression (LTP).

METHOD AND MATERIALS
This retrospective study was approved by the institutional review board and informed consent was waived. A total of 50 patients with at least one HCC with LTP (mean ± SD, 1.5 ± 0.6 cm; range, 0.5-3.0 cm) after prior RFA or chemoembolization were included. Planning US was performed by two radiologists using conventional US first and fusion imaging later in the same session. We assessed false positive detection rate on conventional US based on the results of fusion imaging. We also evaluated how many cases of initially invisible tumors...
on conventional US became visible after image fusion. True positive detection rate and conspicuity scores of the index tumors were compared between conventional US and fusion imaging.

RESULTS
On conventional US, 40 (80%) out of 50 HCCs with LTP were identified. However, false positive detection rate of conventional US was 12.5% (5/40). Out of 10 initially invisible HCCs with LTP on conventional US, 6 (60%) became visible after image fusion. True positive detection rate on conventional US was 70% (35/50) whereas it was increased to 92% (46/50) after image fusion (P=0.0026).

CONCLUSION
Fusion imaging of real-time US with liver CT/MR images can improve conspicuity of lesions and reduce false positive detection of HCCs with LTP.

CLINICAL RELEVANCE/APPLICATION
Fusion imaging of US and liver CT/MR images is useful for guidance of percutaneous RFA of HCCs with LTP. It can improve the lesion conspicuity and decrease the rate of false positive detection.

SSQ07-03 ● The Diagnostic Accuracy of Dual Energy CT Performed within 24 Hours in the Detection of Residual Tumor Following RF Ablation

Steven Van Hedent MD (Presenter) ; Frederik Vandenbroucke MD ; Nico Buls DSc, PhD * ; Koenraad H Nieboer MD * ; Michel De Maeseneer MD ; Johan De Mey * ; Gert Van Gompel PhD

PURPOSE
To evaluate the diagnostic accuracy of single source dual energy CT (DECT) performed within 24 hours after RF ablation in the detection of residual tumor.

METHOD AND MATERIALS
Thirty-three patients with 38 malignant lesions (20 liver, 10 kidney, 8 lung) underwent DECT within 24 hours after RF ablation. DECT data were reconstructed as monochromatic 70 keV images, grayscale iodine (GI) density and color-coded iodine (CCI) density images. Two readers independently rated the presence of residual tumor. The gold standard for presence of residual tumor consisted of follow-up imaging after 8-10 weeks. Statistical analysis consisted of ROC analysis (multicase, multireader). A Bland-Altman plot was used to compare reader agreement and a t-test was performed to assess the significance of these results.

RESULTS
Ten of 38 (26.3%) lesions showed tumor progression at 8-10 weeks. The mean AUC for both readers and all lesions was 0.87 (CI: 0.72-0.96) for 70keV, 0.80 (CI: 0.63-0.91) for CCI and 0.70 (CI: 0.53-0.84) for GI images. Pairwise comparison for the 3 reconstructions showed significant differences, but interreader variability was high for all three reconstructions (p For liver and lung lesions AUC values were higher on 70 keV images (0.89 and 0.88 respectively), than on CCI (0.81 and 0.69) and GI images (0.78 and 0.50). Pairwise comparison showed no significant differences (P>0.05).

CONCLUSION
1. DECT may be a promising method for detection of residual tumor within 24 h after RF ablation.
2. Our study suggests that no difference in accuracy exists between monochromatic 70 keV images, GI, and CCI.

SSQ07-04 ● Clinical Implications of Negative and Inconclusive Percutaneous Ultrasound-guided Biopsy of Focal Liver Lesions

Jason A Pietryga MD (Presenter) ; Alison J Kim MD ; Rendon C Nelson MD *

PURPOSE
To describe our clinical experience with ultrasound-guided biopsies of focal liver lesions and to determine if small lesion size (=3cm), patient body habitus, or history of cirrhosis affect the rate of inconclusive/negative biopsy results.

METHOD AND MATERIALS
This is an IRB-approved HIPAA-compliant study. A retrospective search identified 283 consecutive adults who underwent US-guided biopsy of a focal liver lesion with pathology results from 1/1/2011 to 7/31/2012. Medical records/PACS were reviewed to identify the lesion sizes, patients' BMI, history of cirrhosis and prior malignancy, and biopsy results. Rates of inconclusive/negative biopsy results were compared between patients with lesions =3 vs. >3cm, obesity vs. no obesity, and cirrhosis vs. noncirrhosis. Correlation of results with history of prior malignancy was also performed. Statistical analysis of the comparisons was performed using a Fisher's exact test with a p-value < 0.05 deemed significant.

RESULTS
15.5% (44/283) of the biopsies had inconclusive/negative results. 25% (11/44) of these patients went on to rebiopsy or excision of which 45% (5/11) were diagnostic of malignancy. 19.0% (29/153) of lesions = 3cm had inconclusive/negative results vs. 9.4% (124/1353) of lesions >3cm (p=0.02), 21.4% (18/84) of obese patients had inconclusive/negative results vs. 13.1% (23/176) of nonobese patients (p=0.063). 52.9% (9/17) of cirrhotic patients had inconclusive/negative results vs. 13.2% (35/266) of noncirrhotic patients. 10.7% (21/197) of patients with a known cancer were diagnosed with a new additional cancer (i.e. new primary).

CONCLUSION
A minority (15.5%) of patients who underwent US-guided biopsy of a focal liver lesion had inconclusive or negative results. Having a lesion =3cm or a history of cirrhosis increases the rate of inconclusive/ nondiagnostic results. Obesity may increase the rate of inconclusive or negative results. A significant minority of liver lesions in a patient with a known cancer represent disease from a new primary.

CLINICAL RELEVANCE/APPLICATION
A negative or inconclusive biopsy of either a small liver lesion or a lesion in a patient with cirrhosis should undergo further work-up as it is associated with a significant false negative rate.

SSQ07-05 ● Usefulness of a Second Biopsy after a First Inconclusive One for the Diagnosis of Small Hepatocellular Carcinoma in Cirrhotic Patients

Christophe Aube MD, PhD * ; Frederic Oberti MD ; Benoît P Gallix MD ; Olivier Seror ; Aurore Caumont-Prim MSc ; Valerie Vilgrain MD (Presenter)

PURPOSE
When radiological hallmarks of hepatocellular carcinoma (HCC) as defined by EASL/EORTC Clinical Practice Guidelines are not seen on imaging, biopsy of nodule larger than 1cm is recommended. The goal of our study was to determine the usefulness of a second biopsy when the first one is inconclusive.

METHOD AND MATERIALS
In a multicenter prospective study of 430 cirrhotic patients with nodules < 3 cm detected during surveillance, 152 patients (mean age = 61.95 +/- 8.86 years) with 165 nodules had a percutaneous biopsy of a nodule and adjacent liver using 18G-cutting needles. When the first biopsy was inconclusive (no pathologic diagnosis of nodules), a second biopsy was proposed.

RESULTS
The mean diameter of the nodules was 19.4 +/- 5.7 mm. At first biopsy, the diagnosis was HCC, dysplastic nodule and regenerative
Fluoroscopic guided J-arm placement is safe for patients requiring jejunal nutrition. Tubes should be replaced within 90 days.

Fluoroscopy guided J-arm placement was safe, with low procedural complication rate. Fluoroscopy time was the only predictor of technical complications and a risk factor for procedure success (p=0.0015). When categorizing patients on the basis of INR and platelet level alone, there was a significant increase in hemorrhagic complications in patients with INR>1.5 (12% vs 1.9%; p=0.003) and platelets<25,000/uL (13.3% vs 1.9%; p=0.008), however, patients with INR levels initially greater than 1.5 who received FFP and were correctly corrected (INR 1.46 ± 0.07) had a similar hemorrhagic complication rate (11.1%) as those whose INR levels were not corrected (INR 1.9 ± 0.33, 15.4%).

CONCLUSION
Based upon a review of the literature, we changed our coagulation guidelines for percutaneous liver biopsy to INR25,000/uL, which has resulted in increased FFP transfusion while maintaining a low complication rate, and has had a positive impact on our overall workflow. Patients with INR>1.5 and platelets

SSQ07-06 • Coagulation Profiles: Can We Safely Relax the INR and Platelet Parameters for Image-guided Percutaneous Liver Biopsy?

Doug R Kitchin MD (Presenter) ; Lucas Ludeman MD ; J. Louis Hinshaw MD *

PURPOSE
To identify differences in hospital course and overall treatment cost when comparing CT-guided percutaneous drainage with open surgical repair for gastrointestinal anastomotic leaks.

METHOD AND MATERIALS
RESULTS
CONCLUSION
Gastrointestinal anastomotic leaks managed by percutaneous drainage are associated with lower overall cost and shorter hospital stays compared with open surgical management.

CLINICAL RELEVANCE/APPLICATION
Evidence supporting the use of percutaneous CT-guided drainage for gastrointestinal anastomotic leaks over open surgical management.

SSQ07-07 • CT-guided Percutaneous Drainage versus Surgical Repair of Gastrointestinal Anastomotic Leaks: Is There a Difference in Hospital Course or Overall Treatment Cost?

Lauren M Burke MD (Presenter) ; Mustafa R Bashir MD * ; Carly S Gardner MD ; Arthur A Parsee MD ; Daniele Marin MD ; David P Vermess MD ; Syamal D Bhattacharya ; Tracy A Jaffe MD

PURPOSE
To identify differences in hospital course and overall treatment cost when comparing CT-guided percutaneous drainage with open surgical repair for gastrointestinal anastomotic leaks.

METHOD AND MATERIALS
METHOD AND MATERIALS
RESULTS
CONCLUSION
Gastrointestinal anastomotic leaks managed by percutaneous drainage are associated with lower overall cost and shorter hospital stays compared with open surgical management.

CLINICAL RELEVANCE/APPLICATION
Evidence supporting the use of percutaneous CT-guided drainage for gastrointestinal anastomotic leaks over open surgical management.

SSQ07-08 • Fluoroscopically-guided Jejunal Extension Tube Placement through an Existing Gastrostomy Tube in Patients Requiring Nutrition beyond the Ligament of Treitz: Analysis of 391 Procedures Performed over 3 Years

Andre Ulfflacker MD (Presenter) ; Yujie Qiao ; Genevieve G Easley BS ; James Patrie MS ; Drew L Lambert MD ; Eduard E De Lange MD

PURPOSE
To evaluate outcomes of fluoroscopic placement of a jejunal extension (J-arm) in patients with an already existing gastrostomy (G) tube.

METHOD AND MATERIALS
RESULTS
CONCLUSION
Fluoroscopic time placement was negatively associated with procedure success (p=0.0015).

FLUOROSCOPY GUIDED J-ARM PLACEMENT
Fluoroscopically-guided J-arm placement was safe, with low procedural complication rate. Fluoroscopy time was the only predictor of technical success. Tubes replaced after 90 days had higher rates of tube malfunction.

SSQ07-09 • Biliary Drainage in 30 Patients with Undilated Bile Ducts Affected by Biliary Fistula due to Pancreatobiliary Surgical Treatment: Technique, Feasibility, Complications, and Clinical Outcome

Massimo Venturini MD (Presenter) ; Francesco A De Cobelli MD ; Stefano Cappio MD ; Marco Salvioni ; Giulia Agostini ;
Patients with Normal Liver Function Tests (LFTs)

SSQ08-02

Thursday, 10:30 AM - 12:00 PM

Percutaneous Transhepatic Colangiography (PTC) and placement of a percutaneous biliary drainage (8-French) was attempted in 30 patients affected by biliary fistula, demonstrated by the presence of bile in abdominal surgical drainage, with bilirubin normal levels and ultrasonographic evidence of undilated biliary ducts. Under ultrasonographic (and fluoroscopic) guidance, the puncture attempt with Chiba needle (21G) was performed using a right approach puncturing along the course of the sixth segment portal branch, or a left approach in case of aerobilia and adequate volume of the left hepatic lobe.

RESULTS

PTC was successfully performed in 28/30 patients (21 cases with right approach, 7 with left approach) with radiological demonstration of biliary fistula (direct opacification of the fistula adjacent to the biliary-digestive anastomosis and fluoroscopic demonstration of contrast material in the surgical drainage). Biliary drainage was placed in 27/30 patients (90%) at first attempt, in 1/30 patients (3.3%) at second attempt two days later, placing in 23 patients an external-internal drainage, in 5 patients an external drainage, obtaining complete resolution of the fistula in all cases. No periprocedural complications were recorded. In 2/30 patients, biliary drainage couldn't be placed: surgical retrieval was necessary in one case while in the other case biliary fistula spontaneously resolved.

CONCLUSION

Percutaneous biliary drainage under ultrasonographic/fluoroscopic guidance in patients with undilated biliary ducts affected by biliary fistula is feasible, effective and without significant periprocedural complications and represents the first choice of treatment; furthermore PTC is an accurate tool to confirm the diagnosis of biliary fistula after pancreatobiliary surgical treatment.

CLINICAL RELEVANCE/APPLICATION

PTC and percutaneous biliary drainage represent the first therapeutic option in case of biliary fistula due to pancreatobiliary surgery.

Gastrointestinal (Gallbladder and Biliary Imaging)

Thursday, 10:30 AM - 12:00 PM • E353C

SSQ08-01 • Early Gallbladder Cancer: CT and MR Findings with Pathologic Correlation

Charles H Mitchell MD (Presenter) ; Pamela T Johnson MD * ; Elliot K Fishman MD * ; Ralph H Hruban * ; Siva P Raman MD

PURPOSE

The majority of early gallbladder cancers are diagnosed incidentally following cholecystectomy. With the widespread use of CT, patients with unsuspected gallbladder cancer will undoubtedly be imaged for other indications. Radiologists should be aware of the subtle findings associated with smaller cancers, so as to detect lesions when still in resectable stages.

METHOD AND MATERIALS

Following IRB approval, 18 patients (10 female, 8 male) were identified in the pathology database with T1, T2, and T3 gallbladder cancers. Patient demographics were recorded, and the medical record was searched to determine if the tumor was correctly diagnosed on CT, MRI, or US. Each of the patients' preoperative CT or MRI studies were retrospectively reviewed by a board-certified radiologist with regard to tumor morphology (focal thickening, diffuse thickening, polyploid mass), tumor size, presence of gallstones, lymphadenopathy, carcinomatosis, and liver invasion/metastases.

RESULTS

There were 2 T1 tumors, 6 T2 tumors, and 10 T3 tumors. 10 patients were found to have lymph node metastases at surgery, with 4 of these identified during retrospective CT/MR review. 6 lesions presented as a discrete polyploid mass, 9 as focal wall thickening, and 3 as diffuse wall thickening. Of the 6 polyploid masses, the mean maximum diameter was 37 mm (range 15 - 61 mm). Of the 9 tumors with focal wall thickening, the average thickness was 9 mm (range 8 - 24 mm) over a length of 32 mm. CT correctly identified the malignancy prospectively in 12/18 cases, while ultrasound did not make the correct diagnosis prospectively in 2/3 cases. 5 cases demonstrated hepatic invasion and 4 cases demonstrated gallstones.

CONCLUSION

The cross-sectional imaging findings of early gallbladder cancer can be subtle: The most common appearance in this series was limited focal wall thickening, and even the polyploid masses were quite small. Not surprisingly, 1/3 of cases in this series were not correctly diagnosed prospectively on CT/MRI. Identification requires an understanding of the appearance of early gallbladder cancer and dedicated evaluation of the gallbladder in every case. Future investigations should evaluate the utility of MPRs for improving diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

The findings of gallbladder cancer in its earliest stages can be extremely subtle, requiring a careful evaluation of the gallbladder in both the axial plane and using multiplanar reformat.

SSQ08-02 • The Yield of Magnetic Resonance Cholangiopancreatography (MRCP) for the Investigation of Dilated Bile Ducts in Patients with Normal Liver Function Tests (LFTs)

Shlomit R Tamir MD (Presenter) ; Ofer Benjaminov MD ; Assaf Issachar MD ; Marius Braun

PURPOSE

To evaluate the yield of MRCP for the investigation of incidental biliary duct dilatation in patients with normal as compared to those with elevated LFTs.

METHOD AND MATERIALS

This was a retrospective study conducted on MRCP scans of 113 consecutive patients referred to our tertiary medical center for the evaluation of biliary duct dilatation seen on previous imaging (CT, US). Biochemical data were collected from the medical records: ALT, AST, ALP, GGT and Bilirubin. Only patients with bile duct dilatation confirmed on MRCP were included in the study group. Pathology findings were compared between two groups of patients with bile duct dilatation: normal versus elevated LFTs.
RESULTS
Complete data was available for 68 patients. MRCP confirmed bile duct dilatation in 53 patients who therefore consisted our study group; 28 pts. had normal and 25 pts had elevated LFTs. MRCP demonstrated the cause of bile duct dilatation in 34 pts. (64%), more commonly in pts who were elevated (n=18, 72%) than normal (n= 16, 57%) LFTs. Pathologies which did not require further evaluation or treatment (space occupying lesion, cholelithiasis, severe stricture) were more commonly seen in the elevated LFTs group (16/25, 64%) than in the normal LFTs group (9/28, 32%), (p<0.05).

CONCLUSION
MRCP is a valuable tool in the workup of biliary dilatation even in the setting of normal LFTs, as the probability of an obstructing pathological finding is not negligible. However, it is less likely to find an obstructing pathology, or even a reassuring benign etiology, in patients with normal as compared to elevated LFTs.

CLINICAL RELEVANCE/APPLICATION
Appropriate criteria should be set for MRCP in patients with incidental biliary dilatation and normal LFTs, weighing the low but significant prevalence of obstructing pathology in these patients.

SSQ08-03 • T1 Mapping on Gadoxetate Disodium Enhanced MRI in Patients with Primary Sclerosing Cholangitis (PSC)
Kristina I Ringe MD (Presenter); Marcel Gutberlet DipPhys; Frank K Wacker MD *; Hans-Juergen Raatschen MD

PURPOSE
To assess the value of T1 mapping of the liver on gadoxetate disodium enhanced MRI in patients with PSC for evaluation of liver function and to determine a possible correlation with severity of disease.

METHOD AND MATERIALS
26 patients (17 males, 9 females; mean age 43 years) with confirmed diagnosis of PSC who underwent gadoxetate disodium enhanced hepatic MRI on a 1.5T system were included in this prospective IRB-approved study. T1 mapping of the whole liver was performed using a 3D spoiled gradient echo sequence with flip angles (5° and 15°) before (TP1) and approximately 17 minutes (TP2) after i.v. contrast injection. T1 values were measured by placing ROIs in each liver segment on identical positions of the corresponding datasets and compared (T-Test). Mean T1 changes (TP1-TP2) were calculated and correlated with liver function tests (Pearson), which were obtained within 24 hours of the MRI scan.

RESULTS
Significant changes of T1 relaxation times between non-enhanced and gadoxetate disodium enhanced MRI could be observed in all liver segments (p<0.05). On a segmental level, T1 relaxation times significantly decreased on gadoxetate disodium enhanced MRI in patients with PSC. Regarding the whole liver, the decrease of T1 relaxation times significantly correlated with bilirubin, alkaline phosphatase and cholinesterase levels, whereof fluctuations during the course of the disease are common.

CLINICAL RELEVANCE/APPLICATION
T1 mapping of the liver in patients with PSC may serve as a useful method to assess liver function and probably indirectly severity of the disease on a global as well as on a segmental level.

SSQ08-04 • Relapsed IgG4-related Sclerosing Cholangitis after Steroid Therapy: Image Findings and Risk Factors
Myung-Won You (Presenter); Jin Hee Kim MD; Jae Ho Byun MD; Seung Soo Lee MD; Hyoung Jung Kim MD; Myung-Hwan Kim; Moon-Gyu Lee MD

PURPOSE
To compare image findings of IgG4-related sclerosing cholangitis (IgG4-SC) between initial attack and relapse and to determine the risk factors associated with relapse of IgG4-SC.

METHOD AND MATERIALS
Of 99 patients with pathologically or clinically diagnosed IgG4-SC, 59 patients who had received steroid therapy and had been thoroughly followed up with imaging examinations were included. Among them, 23 were identified to have relapse of IgG4-SC. CT, MRCP, and ERCP at initial attack of all 59 patients and at the time of relapse of 23 patients were reviewed by two radiologists in consensus regarding the extent and degree of bile duct changes and extrabiliary organ involvement. The clinical data including patients’ age and gender, serology and pathology findings, if available, and steroid therapy regimen at initial attack were recorded. For 23 patients with relapsed IgG4-SC, image findings were compared between initial attack and relapse. To determine risk factors of relapse, image findings and clinical data at initial attack were compared between 23 patients with relapse and 36 patients without relapse using univariate and multivariate analysis.

RESULTS
The relapsed IgG4-SC was characterized by more frequent extravascular and multiple bile duct strictures, a greater number of involved bile duct segment, thicker bile duct wall, and a less frequent combination with autoimmune pancreatitis compared with initial attack (P=.016). On univariate analysis, relapse group was significantly associated with a less frequent performance of maintenance therapy, more frequent extravascular and multiple bile duct strictures, a greater number of involved bile duct segment, and thicker bile duct wall at initial attack than in non-relapse group (P=.023). On multivariate analysis, no performance of maintenance steroid therapy and more severe bile duct wall thickening were independently associated with relapse, with odds ratio of 6.6 and 4.1, respectively (P=.041).

CONCLUSION
The image findings of IgG4-SC at relapse were more aggressive than those at initial attack. The severity of bile duct changes and the performance of maintenance steroid therapy were associated with relapse of IgG4-SC after steroid therapy.

CLINICAL RELEVANCE/APPLICATION
When there are severe bile duct changes in patients with IgG4-SC, more aggressive steroid therapy than standard regimen and maintenance therapy may be necessary due to a high risk of relapse.

SSQ08-05 • Mucus Thread Sign of the Biliary Intraductal Papillary Mucinous Neoplasm on Magnetic Resonance Imaging Including Magnetic Resonance Cholangiography and Diffusion-weighted Imaging
Gil-Sun Hong MD (Presenter); Jae Ho Byun MD; Seung Soo Lee MD; Namkug Kim PhD; Jin Hee Kim MD; Hyoung Jung Kim MD; Yedaun Lee MD; Moon-Gyu Lee MD

PURPOSE
To evaluate a mucus thread sign of biliary intraductal papillary mucous neoplasm (IPMN) on magnetic resonance imaging (MRI) including MR cholangiography (MRC) and diffusion-weighted imaging (DWI).

METHOD AND MATERIALS
This retrospective study was approved by our institutional review board, and informed consent was waived. Forty-one patients with pathologically confirmed biliary IPMNs, were included in this study. The definite mucus thread sign was defined as linear or curvilinear dark striations in the bile duct. The mucus thread sign were retrospectively analyzed on MRI including MRC (thin-section MRC, thick slab MRC, and 3D MRC) and DWI. For quantitative analysis, 18 patients with the definite mucus thread sign on DWI, apparent diffusion coefficient with b-factors of 150 (ADC150) and 1000 (ADC1000) of mucus thread sign were compared with those of normal bile. The
prevalence of definite mucus thread sign was compared among the MRI and MRC sequences. The relationship between prevalence of definite mucus thread sign and the pathologic grade, the diameter of the dilated bile ducts or the maximum diameter of visible mass of biliary IPMN were statistically evaluated.

RESULTS
DWI with a b-value of 150 demonstrated the definite mucus thread sign better than HASTE or TSE T2-weighted images (70% [19/27], 50% [17/34] and 9.1% [3/33], respectively; P < 0.001). At MRC, the definite mucus thread sign was present in 78.0% (32/41) patients with biliary IPMNs. There was no statistically significant difference in the prevalence of the definite mucus thread sign among the three MRC sequences (thin-slice MRC, thick slab MRC and 3D MRC; 67.6% [25/37], 46.2% [18/39] and 45.2% [14/31]; P = 0.093). ADC<sub>50</sub> and ADC<sub>100</sub> of the definite mucus thread sign (3.65 ± 2.43 and 3.02 ± 0.42, respectively) were significantly higher than those of normal bile (3.03 ± 0.32 and 2.72 ± 0.23; P < 0.001 and P = 0.01). The prevalence of definite mucus thread sign correlated well with only the diameter of the extrahepatic bile duct (P = 0.001).

CONCLUSION
The mucus thread sign, a characteristic finding of biliary IPMN, is well demonstrated on MRI including MRC and DWI.

CLINICAL RELEVANCE/APPLICATION
The mucus thread sign on MRI including MRC and DWI is very helpful to diagnose biliary intraductal papillary mucinous neoplasm.

SSQ08-06 • Comparison between Fundamental Images and Harmonic Images with High Back Ground Noise for Detection of Microcrystals in Gall Bladder

You Jin Ku (Presenter) ; Chul Soon Choi MD ; Daeyeon Yoon MD ; Eun Joo Yun ; Young Lan Seo ; Kyongja Lim ; Sora Baek ; Sang H Bae MD, PhD

PURPOSE
To compare conspicuity of fundamental ultrasonographic (FUS) images and harmonic US imaging with high back ground noise(HUSN) for detection of microcrystals in the Gall Bladder.

METHOD AND MATERIALS
From November 30, 2012 to March 18, 2013, patients who showed microcrystals in the Gall bladder detected on US were included in this study. Exclusion criteria were gall stones, gall bladder sludge and acute calculous cholecystitis. During obtaining images, we performed fundamental US images (FUS) and Harmonic US images with high back ground noise (HUSN). All ultrasound examinations were performed by one radiologist, who had more than 20 years of experience in abdominal ultrasound, with an IU 22 ultrasound unit (Philips Medical Systems, Bothell, WA, USA) using a 2- to 5-MHz convex array transducer. After obtaining images, two radiologists who are a 3th year resident and a specialist having 20 years of US imaging, graded the conspicuity of each images with FUS and HUSN in consensus. The grades were G(1): absent microcrystal, G(2): equivocal, G(3): vague but present, G(4): clear and present. Grades of both images are statistically compared with Wilcoxon rank sum test. A p-value less than 0.05 was considered to be statistically significant.

RESULTS
There were 18 patients. Their average age was 55.3 years with standard deviation of 12.8 years. The male to female ratio was 11 versus 7. Six patients revealed symptom and 12 patients were asymptomatic. FUS images were G1 in 7 patients, G2 in 5 patients, G3 in 4 patients, G4 in 2 patients. In contrast to FUS images, HUSN images were G1 in none, G2 in 1 patient, G3 in 2 patients, G4 in 15 patients. Wilcoxon rank sum test showed p-value of 0.0002 between two image grading.

CONCLUSION
HUSN images were superior to FUS images for detection of microcrystals in the gall bladder probably due to Rayleigh scattering.

CLINICAL RELEVANCE/APPLICATION
Harmonic image with high back ground noise could demonstrate microcrystals within gall bladder, which are not usually seen on routine fundamental ultrasonography.

SSQ08-07 • Clinical Utility of MR Cholangiopancreatography in the Assessment of Acute Cholecystitis in the Emergency Setting

Jennifer W Uyeda MD (Presenter) ; Vijay Ramalingam MD ; Amrita P Devalapalli BS ; Stephan W Anderson MD ; Jorge A Soto MD *

PURPOSE
To assess the utility of MRCP in the assessment of acute cholecystitis in the emergency setting with emphasis on patients in whom US and MRCP results are discordant.

METHOD AND MATERIALS
The institutional review board approved this HIPAA-compliant retrospective study. Informed consent was waived. 371 consecutive adults (120 males, 251 females) who presented to the emergency department with abdominal pain between 4/1/2010 and 2/28/2013 who underwent US and MRCP within a 48-hour period were included. MRCP was performed for further assessment of bile duct dilatation. US and MRCP reports were reviewed and were classified as positive, negative or equivocal for the diagnosis of acute cholecystitis. Electronic medical records were reviewed to determine subsequent management and pathology findings.

RESULTS
In 275 (74.1%) of 371 patients, the results of US and MRCP were concordant. 73 (19.7%) patients had negative or equivocal results for acute cholecystitis but MRCP was positive. Of these 73 patients, 52 (71%) underwent cholecystectomy and 3 underwent percutaneous drainage. Of the 92 patients who underwent cholecystectomy with negative or equivocal US findings but positive MRCP findings for acute cholecystitis, 22 (42%) were pathologically proven acute cholecystitis while the remaining 30 were pathologically proven chronic cholecystitis. Of the 371 US examinations, 23 (6.2%) were positive or suspicious for acute cholecystitis on US but negative on MRCP. 14 (61%) of these 23 patients underwent cholecystectomy and 2 (9%) were pathologically proven acute cholecystitis; 12 were pathologically proven chronic cholecystitis.

CONCLUSION
US is the study of choice in patients with acute right upper quadrant suspected to have acute cholecystitis. MRCP provides additional information in select cases. However, MRCP has limitations in discriminating between acute and chronic cholecystitis.

CLINICAL RELEVANCE/APPLICATION
MRCP should be considered in the evaluation of patients suspected to have acute cholecystitis in the emergency setting, particularly when US has negative or equivocal findings.

SSQ08-08 • The Technologist-performed Sonographic Murphy’s Sign: Is It Really an Accurate Test?

Ronald O Bude MD (Presenter) ; Richard K. J. Brown MD * ; Ebah H Youssef MD, FRCR

PURPOSE
In our dept, the sonographic Murphy’s sign, performed by technologists who have not been physician-trained to elicit it, is generally considered the best ultrasound test for detecting acute cholecystitis. Technologist criteria for a positive test vary widely, from pain at probe contact of the RUQ skin to pain at probe palpation of the gallbladder in deep inspiration. We questioned the validity of this evaluation and performed a study to evaluate the test done this way.

METHOD AND MATERIALS
HIDA scan was the gold standard for detection of acute cholecystitis, due to the variability of our pathologists' criteria (which varied from a few lymphocytes in the gallbladder wall to the need for transmural perforation) and the subjectivity and potential bias of the surgeons’ impressions at operation. All adults in a consecutive 3 year period fulfilling the following criteria were studied: unequivocal HIDA scan; US within one day of HIDA; recorded unequivocal sonographer’s Murphy sign evaluation. Timing of narcotic analgesia was noted. Sensitivities and specificities were calculated.

RESULTS
Study population: 383 patients. The Murphy’s sign is used in our dept. without taking narcotic analgesia or presence of gallstones into account. Used this way the sensitivity and specificity for detecting acute cholecystitis, respectively, were 45% (46/103) and 57% (159/280). Interestingly, 43% of patients (163/383) had narcotic analgesia within two hours before US, which probably influenced the results. However, even when considering patients with gallstones who did not have narcotic analgesia for at least 24 hours before US, the sensitivity and specificity were still only 63% (20/32) and 60% (36/60), respectively. Sensitivities and specificities for other combinations of stones/no stones and narcotic timings were similarly unimpressive, but space limits giving them here.

CONCLUSION
The sonographic Murphy’s sign, when performed by technologists not trained in its performance, is neither sensitive nor specific for the detection of acute cholecystitis. It remains to be proven whether this test is useful when performed by physicians, or by ancillary personnel specifically trained in its performance, given the prevalence of narcotic analgesia.

CLINICAL RELEVANCE/APPLICATION
The sonographic Murphy’s sign, performed by technologists not specifically trained for it, is neither sensitive nor specific for the detection of acute cholecystitis.

SSQ08-09 • MR Signal Change of Hepatobiliary Imaging after Oral Ingestion of Manganese Chloride Tetrahydrate: Preliminary Examination

Nagaaki Marugami (Presenter); Megumi Takewa MD; Junko Takahama MD; Aki Takahashi MD; Tomoyuki Oukai; Kimihiko Kichikawa MD

PURPOSE
Manganese Chloride Tetrahydrate (MCT) is widely used as a negative oral contrast agent to improve the image quality of MRCP. The purpose of this study is to clarify the MR signal change of the hepatobiliary imaging due to the absorption and excretion of MCT even during routine clinical MRCP examination by assessing it quantitatively.

METHOD AND MATERIALS
The subjects were MCT phantom, 10 healthy volunteers and 155 consecutive patients. In phantom study, the relationship between MCT concentration and MR signal intensity (2D MRCP, T1WI and R2* mapping) was evaluated. In volunteer study, we analyzed the time course of hepatobiliary imaging control, 30, 60, 120 and 180 minutes after oral ingestion of MCT qualitatively and quantitatively. In clinical study, we analyzed the incidence and factor affecting signal change on additional MRCP with MCT as a final scan during routine clinical MRCP examination.

RESULTS
In phantom study, a significant excellent linear positive correlation was found between MCT concentration and R2* value (r2=0.996, p<0.001). In volunteer study, we analyzed the incidence and factor affecting signal change on additional MRCP with MCT as a final scan during routine clinical MRCP examination.

CONCLUSION
We recommend that MRCP be performed early after oral ingestion of MCT because signal drop happens even during routine MRCP.

CLINICAL RELEVANCE/APPLICATION
The delineation of the biliary duct and increase of hepatic R2* value after oral ingestion of MCT may be obtained as additional benefits of contrast enhanced MRCP and quantification of manganese uptake.

Vascular/Interventional (Radioembolization)

Thursday, 10:30 AM - 12:00 PM • N227

SSQ21 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator
Hyun S Kim, MD
Moderator
Charles T Burke, MD

SSQ21-01 • Prospective Randomized Comparison of Selective Internal Radiation Therapy (SIRT) versus Transarterial Chemoembolisation (TACE) for the Treatment of Hepatocellular Carcinoma (HCC)

Roman Kloeckner MD (Presenter); Waltraud Eichhorn; Gerd Otto MD; Marcus A Worns; Christoph Dueber MD; Michael B Pitlon MD

PURPOSE
To prospectively compare SIRT and Drug Eluting Bead-TACE (DEB-TACE) for the treatment of intermediate stage HCC.

METHOD AND MATERIALS
From 04/2010 to 04/2013, a total 24 patients with histology proven irresectable intermediate stage NO, M0 HCCs were randomized to receive SIRT or DEB-TACE. Randomization was stratified according to tumor load < or =25%. SIRT was performed in a bilobar approach and could be repeated once for each lobe in case of recurrence. TACE was repeated every 6 weeks until either no viable tumor tissue was detected by MRI or if contraindications prohibited further treatment. Follow-up was carried out by MRI in 3 month intervals.

RESULTS
Each group consisted of 12 patients. Demographic data were not considerably different between both groups (SIRT: 8 male / 4 female, mean age 72 ± 7 years; TACE: 10 male / 2 female, mean age 71 ± 9 years). 1 patient in each group had an initial tumor load =25%. Each group consisted of 12 patients. Demographic data were not considerably different between both groups (SIRT: 8 male / 4 female, mean age 72 ± 7 years; TACE: 10 male / 2 female, mean age 71 ± 9 years). 1 patient in each group had an initial tumor load =25%. Mean follow up period in the SIRT group was 394 ± 311 days compared to 385 ± 292 days. Overall median survival was 592 days. There was no significant difference in median survival between both groups (p=0.81). 7 SIRT patients died (5x liver failure, 1x deterioration of general condition and 1x subacute liver/kidney failure after surgical therapy of a pseudoaneurysm of the common femoral artery). 6 TACE patients died (3x tumor progress, 1x liver failure, 1x bleeding of esophageal varices, 1x deterioration of general condition after coronary bypass surgery).

CONCLUSION
No significant difference was found in median survival between SIRT and TACE in intermediate stage HCC-patients. The lower rate of tumor progression in the SIRT group was nullified by a greater incidence of liver failure.

CLINICAL RELEVANCE/APPLICATION
This is the first prospective randomized study comparing SIRT and TACE for the treatment of HCC. Further studies with a greater number of patients are essential.

SSQ21-02 • PET/MRI of Hepatic 90Y Microsphere Uptake: Correlation of Angiographic and Radiologic Findings with Microsphere
Intratumoral Vascular Shunting: The Missing Link between Circulating Tumor Cells and Metastasis?

Amy R Deiopoly MD, PhD (Presenter) ; Patrick D Sutphin MD, PhD ; Siddharth Govindan MD ; Suvranu Ganguli MD * ; Rahmi Oklu MD, PhD

PURPOSE
Colorectal carcinoma is a leading cause of cancer mortality mostly due to metastasis. It is unclear how large circulating tumor cells (CTCs) shed from the tumor traverse capillary beds to establish distant lesions. Intratumoral vascular shunting, however, may provide a conduit for CTCs to access distant sites. To determine whether intratumoral shunting is associated with metastasis, we assessed how tumor shunting relates to the presence of disseminated disease and to clinical outcome.

METHOD AND MATERIALS
61 colorectal cancer patients with liver metastases (30 F, 31 M; mean age 63 yr) were evaluated for selective internal radiation therapy (SIRT) from 5/07 to 8/12. Following transcatheter injection of radioactive particles (99mTc-MAA), lung shunt fractions (LSF) were calculated reflecting the amount of intratumoral shunting of MAA particles, which can measure up to 150 microns. Medical records were reviewed for other metastases and the size of liver lesions before and after SIRT, the time between SIRT and disease progression, and patient survival after SIRT. Liver tumor size was estimated using the largest dimension of the largest lesion. The relationship of LSF and estimated tumor size to outcomes was assessed using linear regression and student's t test.

RESULTS
Patients with lung metastases at the time of SIRT had significantly higher LSF (mean 9.2%) than patients without lung metastases (mean 6.1%) (p

CONCLUSION
LSF may be a more robust marker of metastatic potential than tumor size. Increased LSF due to vascular shunting within liver metastasis is an indicator of distant lesions and is associated with more rapid disease progression after SIRT. Intratumoral shunting may provide a conduit for CTCs to access more remote organs, bypassing filtration by liver parenchyma and may be an important factor in metastatic
CLINICAL RELEVANCE/APPLICATION
Vascular shunting in liver metastases from colorectal cancer is a robust indicator of more distant metastases and future disease progression, and may be a more useful clinical marker than tumor size.

SSQ21-06 • Boosted Selective Internal Radiation Therapy (B-SIRT) Using 90Y-loaded Glass Microspheres Induces Prolonged Overall Survival for PVT Patients

Etienne Garin MD (Presenter) *; Laurence Lenoir; Julien Edeline; Evelyne Boucher; Yan Rolland MD, PhD *

PURPOSE
Evaluation of the response rate and survival of hepatocellular carcinoma PVT patients treated with Therasphere using the boost concept.

METHOD AND MATERIALS
Therasphere was administered in 40 PVT hepatocellular carcinoma patients (main=11, lobar = 23, segmental= 6). MAA SPECT/CT quantitative analysis was used for the calculation of the tumour dose (TD), the healthy injected liver dose (HLD) and the injected liver dose (LD). Response was evaluated at 3 months using EASL criteria. OS was evaluated using Kaplan and Meyer tests.

RESULTS
Mean 90Y-loaded microspheres injected activity was 3.1±1.5 Gbq, Mean LD was 143±49Gy. Median TD was 316Gy for responding lesions versus 133Gy for non responding lesion (p 205Gy with a LD > 150 Gy and a HLD205Gy. OS was 12m [3-8] for patients with main PVT versus 21.5m [12-28.7] for patients segmental or lobar PVT (ns). Finally Os was 23.2m for patients with a TD>205Gy and a good PVT targeting (n= 34).

CONCLUSION
Boosted selective internal radiation therapy using 90Y-loaded glass microspheres induces prolonged overall survival for PVT patients without increasing liver toxicity.

CLINICAL RELEVANCE/APPLICATION
Boost selective internal radiation therapy using 90Y loaded glass microsphere allows a fully customized oncological therapy for PVT patients inducing prolonged survival.

SSQ21-07 • Sorafenib versus Y90-radioembolization in Cirrhotic Patients with Hepatocellular Carcinoma (HCC): Cohort and Nested Control-case Study with Propensity Analysis

Alberta Cappelli MD (Presenter); Cristina Mosconi; Annagiulia Gramenzi; Sara Marinelli; Alessandro Granito; Virginia Erroi; Silvia Fiumana; Mauro Bernardi; Luigi Bolondi; Franco Trevisani; Rita Golfieri MD

PURPOSE
Sorafenib and Transarterial Y90-radioembolization (TARE) are treatments currently available for advanced (BCLC stage C) HCC not amenable or resistant to curative options and transarterial chemoembolization (TACE). No study comparing the outcome of these patients (pts) is yet available. We performed a case-control, retrospective study to compare the survival in both groups comparing the two treatments after patients' matching for the independent prognostic factors.

METHOD AND MATERIALS
67 Sorafenib pts and 63 TARE pts were selected. The two groups did not significantly differ for gender, aetiology, previous HCC treatments, portal vein thrombosis, Child-Pugh class, MELD score, BCLC stage, alpha-fetoprotein levels, ascites, creatinine, platelet count. Median survival did not differ between Sorafenib (13.1 months; 95% CI: 3.1-25.0) and TARE (13.2 months; 6.1-20.2; P=0.854) and mortality rate at 1, 2 and 3 years was respectively 48%, 70% and 86% vs 48%, 73% and 80%. Propensity model matched 34 pts for independent non co-axial prognostic factors: PS, MELD, portal thrombosis, tumour gross pathology. Median survival was 13.1 months (1.3-25.0) for Sorafenib and 9.0 months (3.7-14.3) for TARE (P=0.214).

CONCLUSION
In advanced HCC not otherwise treatable, Sorafenib provides, after adjustment for the confounding factors, a not statistically significant better survival than TARE.

CLINICAL RELEVANCE/APPLICATION
In advanced HCC treated with Sorafenib or TARE, the propensity analysis demonstrates that median survival is better after Sorafenib but not statistically different (13.1 vs 9.0 months: P=0.214).

SSQ21-08 • A New Model to Estimate Prognosis after Yttrium-90 Radioembolization in Patients with Hepatocellular Carcinoma

Thomas C Lauenstein MD (Presenter); Judith Ertle; Stefan P Mueller MD *; Andreas Bockisch; Guido Gerken; Joerg Schlaak

PURPOSE
A prognostic model to estimate the survival in hepatocellular carcinoma (HCC) patients treated with transarterial hepatic selective internal radiotherapy (SIRT) is not fully characterized. We aimed to establish a new scoring model including assessment of both tumor responses and therapy-induced systemic changes in HCC patients to predict survival at an early time point post-SIRT.

METHOD AND MATERIALS
149 HCC patients treated with SIRT (TheraSphere, MS Nordion, Canada) were included into this study. CT images and biomarkers in blood tested at one month post-SIRT were analyzed and correlated with clinical outcome. Tumor responses were assessed by RECIIST 1.1, mRECIIST, and Choi criteria. Kaplan-Meier methods were used to estimate survival curves. Cox regression was used in uni- and multivariable survival analyses and in the establishment of a prognostic model.

RESULTS

CONCLUSION
A new model including imaging and non-imaging parameters may predict survival of HCC patients at an early time point after SIRT. In this model, Choi criteria should be applied rather than RECIIST or mRECIIST.

CLINICAL RELEVANCE/APPLICATION
Efficacy of SIRT can be predicted one month after therapy.

Gastrointestinal - Thursday Posters and Exhibit (12:15pm - 12:45pm)

Thursday, 12:15 PM - 12:45 PM • Lakeside Learning Center
Utilization of Ancillary Features in Adjusting LI-RADS Category

Amol Shah BS (Presenter); Marilia P Ferreira MD; Kevin A Zand MD; Abdullah T Alturki MD, MBBS; Elhamy R Heba BMBCh; Eduardo A Costa MD; Masahiro Tanabe MD; Cynthia S Santillan MD; Claude B Sirlin MD *

PURPOSE/AIM
The purpose of this exhibit is to:
1. Define ancillary features that may favor HCC.
2. Define ancillary features that may favor benignity.
3. Review when to apply ancillary features to adjust LI-RADS category.

CONTENT ORGANIZATION
- Introduction to LI-RADS: LI-RADS is an ACR-endorsed system of standardized terminology and criteria to interpret and report imaging examinations of the liver. LI-RADS assigns an ordinal score (1 to 5) to liver observations indicating likelihood of HCC.
- Ancillary features definition: imaging features that modify likelihood of HCC.
- Examples of ancillary features favoring HCC.
- Examples of ancillary features favoring benignity.
- How to apply ancillary features to adjust LI-RADS category.
- Sample CT/MR images and schematics of select ancillary features.

SUMMARY
The teaching points of this exhibit are:
1. Ancillary features that may favor HCC may be used to upgrade LI-RADS category by one or more categories (up to but not beyond LR4).
2. Ancillary features that may favor benignity may be used to downgrade LI-RADS category by one or more categories.
3. Absence of ancillary features should not be used to adjust LI-RADS category.
4. Ancillary features may be applied if there is uncertainty in the LI-RADS category.

Non Occlusive Mesenteric Ischemia (NOMI): What Do We Know?

Maria A Mazzei MD (Presenter); Francesco Giuseppe Mazzei; Giusi Imbriaco; Susanna Guerrini MD; Nevada Cioffi Squitieri; Alfredo Cirigliano; Dalila D’ascoli; Daniela Berritto MD; Francesca Iacobellis MD; Luca Volterrani

PURPOSE/AIM
1. To gain awareness about clinical, laboratoristic and imaging features of NOMI.
2. To describe the CT findings of NOMI with and without reperfusion event and to correlate these with pathological features.

CONTENT ORGANIZATION
1. A retrospective analysis of CT findings and anatomopathological features of 30 patients (22 males, mean population age 73.7 years), with a dismissal summary of NOMI.
2. Imaging/pathological correlation in NOMI with and without reperfusion event.

SUMMARY
1. NOMI are increasingly common due to the ageing of society.
2. The prognosis of NOMI is extremely poor because many NOMI patients may not have been diagnosed correctly. Owing to the possibility of the reperfusion event, NOMI can be a dynamic condition and its appearance at imaging could be significantly different depending on these reasons and on the time in which the CT examination is performed. Awareness of CT findings of NOMI with and without reperfusion may bring the benefit of a prompt diagnosis and subsequent early and efficient initiation of therapy, which may improve the mortality.

Dual-Energy Computed Tomography for the Evaluation of Hypovascular Hepatic Metastases? Associations of the Optimal Monochromatic Level with Regard to the Metastasis-to-Liver Contrast Noise Ratio to Patient Size?

Mitsuru Matsuki MD (Presenter); Takamichi Murakami MD, PhD *; Tomoko Hyodo MD; Masahiro Okada MD; Masakatsu Tsurusaki MD, PhD

PURPOSE
To examine the optimal monochromatic levels to acquire a highest metastasis-to-liver contrast-to-noise ratio (CNR) on virtual monochromatic spectral (VMS) imaging by dual-energy CT (DECT) and the associations of the optimal monochromatic levels to patient body size.

METHOD AND MATERIALS
46 hypovascular hepatic metastases of twenty five patients were scanned by DECT in the portal venous phase. The scan was performed with fast kilovoltage switching between 80 and 140 kVp, detector collimation, 0.625 × 64 mm and helical pitch, 1.375. The tube current and rotation speed were adjusted to the computed tomography dose index-volume in a single energy CT acquisition at 120 kVp and Z-axis automatic tube current modulation technique (Noise Index=11). The highest metastasis-to-liver CNRs and the optimal monochromatic levels to acquire the highest metastasis-to-liver CNRs on VMS imaging were measured, and their associations to patient body weight and body mass index (BMI) were examined.

RESULTS
The highest metastasis-to-liver CNR were 6.83±1.6 (range, 3.18-10.83). The optimal monochromatic levels to acquire the highest metastasis-to-liver CNR were 67.91±2.9 (range, 65-74 keV). There was significant positive correlation of the highest metastasis-to-liver CNR to the body weight (r=0.320, p

CONCLUSION
A significant positive correlation was observed between the body size and the optimal monochromatic level with regard to the metastasis-to-liver CNR on VMS imaging. Therefore, we consider that it is necessary to adjust an optimal monochromatic level according to the patient size for the evaluation of hepatic metastases on VMS imaging.

CLINICAL RELEVANCE/APPLICATION
This is the first study demonstrating the associations of the optimal monochromatic level to acquire a highest metastasis-to-liver CNR on virtual monochromatic spectral imaging to patient body size.

Radiation Dose and Image Quality Comparison between Spectral CT and Conventional Multi-slice CT Liver Angiography

Guisheng Wang MD (Presenter); Jianhua Gao

PURPOSE
To compare the radiation dose and image quality including image noise of liver parenchyma and contrast-noise-ratio (CNR) for the veins between spectral CT and conventional multi-slice CT (MSCT) angiography in the liver.
Thirty patients (group A) underwent conventional enhanced portal venous phase (PP) CT and 30 patients in group B underwent dual energy spectral enhanced CT in PP were retrospectively compared. Patients in group A were scanned in a 64-row MSCT with 120kVp and automatic tube current modulation (ATCM) with noise index of 15. Patients in group B were scanned on the Discovery CT750 HD with spectral imaging mode. 101 sets of monochromatic images were reconstructed from a single spectral CT scan. CNR for the veins was calculated using liver parenchyma as background. The optimal energy level for obtaining the highest CNR was automatically determined on the GSI-viewer software. Image noise (at 70keV), CNR (at the optimal keV level) for the vein and radiation dose to the patient were obtained for spectral images and statistically compared with those in group A with the conventional MSCT using SPSS13.

RESULTS
Patient BMI values for the two groups were 24.5±5.31 and 24.9±4.69 with no difference. The radiation dose for spectral CT was 15.64mGy, 30% lower than the 22.44mGy for the conventional MSCT (p<0.05). On the other hand, CNR for the vein at the optimal energy level in spectral CT was 6.20±2.31, significantly higher than the 2.76±1.34 for MSCT with conventional polychromatic 120kVp images (p<0.05).

CONCLUSION
Compared with conventional standard-dose MSCT liver angiography, spectral CT imaging provides a set of monochromatic images for much improved CNR for vessels, comparable image noise for liver parenchyma with 30% dose reduction for standard sized patients.

CLINICAL RELEVANCE/APPLICATION
Spectral CT imaging provides a set of monochromatic images at lower radiation dose for additional information and optimized image noise and contrast-noise-ratio in liver angiography.

LL-GIS-TH3A  ●  Expensive Stones: Ultrasound and MRCP Utilization in the Setting of Acute Biliary Colic. When Does MRCP Add Clinical Value?

Miriam Romero MD (Presenter); Frank K Chen MD; Jonas Castaneda; Phil Wu; Joel Ornelas MD; Phillip M Cheng MD, MS; Steven Cen PhD; Margaret Fleming MD; Suzanne L Palmer MD *

PURPOSE
To correlate the incidence of positive and negative findings on MRCP with laboratory values and findings on preceding abdominal US in patients with acute biliary colic.

METHOD AND MATERIALS
This is a retrospective case series in which we reviewed US and MRCP findings in 100 patients presenting with acute biliary colic to a single institution's Emergency Department over 7 months. Laboratory values, including total bilirubin (T Bil), alkaline phosphatase (AlkP), lipase, amylinase and white blood cell (WBC) were recorded. The presence or absence of gallstones and intrahepatic and extrahepatic biliary dilatation on abdominal US and MRCP were recorded. CBD size was measured on both imaging modalities. Results were recorded for patients that went on to ERCP.

RESULTS
MRCP revealed cholelithiasis in 23 patients, 12 of which were confirmed on ERCP. Eighteen of these stones were not seen on US. Of the remaining 5 patients with stones on MRCP, 2 had CBD sludge and 3 had CBD stones identified on US. MRCP did not provide additional information in these patients. Three patients had stones seen on US that were not visualized on MRCP. No CBD stones were identified on either imaging modality in the remaining 74 patients. CBD size was variable in patients with CBD stones on MRCP, but all had IHDD. However, IHDD on US only had a sensitivity of 65.2% (95% CI: 45.7%, 84.7%) and specificity of 59.7% (95% CI: 48.8%, 70.7%) in predicting a CBD stone on MRCP. Lab abnormalities were present in all patients with MRCP CBD stones, most commonly elevated T Bil (4.3±4.9 vs. 2.4±4.5, p=0.05). However, no statistically significant difference was observed in the laboratory measurements between positive vs. negative stone finding on ERCP, MRCP or US.

CONCLUSION
ACR appropriateness criteria state that MRCP in acute biliary colic may be appropriate in the setting of equivocal or negative US to assess for CBD stones and other etiologies of pain. However, the indications for MRCP in this setting are not precisely defined and MRCP utilization contributes to escalating costs. In the absence of abnormal labs or IHDD on US, MRCP may be of limited value though our study did not reveal definite statistical correlation.

CLINICAL RELEVANCE/APPLICATION
The presence of laboratory abnormalities and IHDD on US may be considered before continuing to MRCP.

LL-GIS-TH4A  ●  Role of Percutaneous Abscess Drainage in the Management of Young Patients with Crohn's Disease

Brian S Pugmire MD (Presenter); Jess Kaplan MD; Mayureewan Taphey; Peter F Hahn MD, PhD *; Daniel Doody MD; Debra A Gervais MD *; Michael S Gee MD, PhD

PURPOSE
Abdominal abscesses are well-known complications of Crohn's disease (CD) and frequently occur in the pediatric population. Percutaneous drainage has been shown to be a safe and effective method for treatment of CD-related abscesses in adults, frequently obviating the need for surgical drainage or providing a bridging procedure to a more controlled elective bowel resection following abscess resolution. Few studies have evaluated the success of this procedure in the pediatric population specifically. We present data from a retrospective review of 26 cases of pediatric patients who underwent percutaneous drainage for CD-related abscesses.

METHOD AND MATERIALS
26 cases of young patients (age < 21 years) with proven CD who underwent percutaneous drainage at an urban general hospital between 1995 and 2012 were retrospectively reviewed. Success of percutaneous drainage was defined as (1) no surgery within one year of drainage with resumption of IBD-related medical therapy (apart from antibiotics) within 8 weeks of the time of drainage or (2) surgical bowel resection following drainage with no evidence of residual abscess on imaging or at surgery. Various characteristics (patient gender and age, abscess size and volume, affected bowel segment, and need for repeat percutaneous drainage) were analyzed using the Fisher exact test to assess for factors associated with treatment success or failure.

RESULTS
The average age of the patients at the time of treatment was 17.5 years (range 10-20 years) with a male to female ratio of 15:11. Using the criteria listed above, 19 of the 26 patients were classified as having undergone successful drainage, six were classified as treatment failures, and one patient could not be classified, giving a treatment success rate of 73%. Among the multiple factors analyzed, abscess volume >100cc was the most strongly associated with treatment success.

CONCLUSION
Percutaneous image-guided drainage is an effective treatment for CD-related abscesses in pediatric patients, based upon a combination of medical and surgical criteria for treatment success.

CLINICAL RELEVANCE/APPLICATION
Percutaneous drainage should be considered for treatment of pediatric patients with CD-related abscesses, thereby avoiding surgical drainage and allowing resumption of anti-inflammatory medications.

LL-GIS-TH5A  ●  Evaluation of Diffusion Weighted Imaging without Bowel Preparation for Detecting Ulcerative Colitis

Huimao Zhang (Presenter); Lili Yu; Haishan Yang MD; Furong Wang; Zhongwen Lv; Butian Zhang

PURPOSE
Spectral CT imaging provides a set of monochromatic images at lower radiation dose for additional information and optimized image noise and contrast-noise-ratio in liver angiography.
To evaluate the value of diffusion-weighted imaging (DWI) in ulcerative colitis without bowel preparation at 3T.

METHOD AND MATERIALS
Twenty patients who underwent magnetic resonance colonography including DWI for ulcerative colitis without bowel preparation, followed by colonoscopy within 24 hours were recruited. DWI was examined under different b values (b=0, 400, 600, 800, 1000 s/mm²). Two radiologists reviewed conventional MR images, contrast enhanced MR images, DWI and ADC maps to evaluate each intestinal segment (rectum, sigmoid, left colon, transverse colon, right colon). Receiver operating characteristic (ROC) and binary logistic regression analysis was used to determine their diagnostic performance.

RESULTS
A total of 100 segments (71 with endoscopic colonic inflammation, 29 normal) were included. The proposed total magnetic resonance score (MR-score-T) correlated with the total modified Baron score (Baron-T) (r=0.875, p) detected endoscopic colonic inflammation with a sensitivity of 93.0% and specificity of 79.3%, with an area under the curve (AUC) of 0.929 (p < 0.05). DWI hyperintensity from b =800 s/mm² detected endoscopic colonic inflammation with a sensitivity of 93.0% and specificity of 79.3% with an AUC of 0.867 (p2) was 0.932 (95% confidence interval, 0.881–0.983) for detection of endoscopic inflammation. The threshold ADC value, 2.18×10⁻³ mm²/s, provided differentiation of endoscopic inflammation from normal intestinal segment with a sensitivity of 89.7% and specificity of 80.3%.

CONCLUSION
DWI without bowel preparation is a helpful method for detecting colonic inflammation in ulcerative colitis.

CLINICAL RELEVANCE/APPLICATION
DWI-MRI without bowel preparation demonstrate a good diagnostic performance for detecting UC. It is typically reserved for patients who are intolerant or fail to undergo the examination.

LL-GIS-TV3A • Interobserver Variability in MaRIA Score Calculation for Assessing Severity of Crohn’s Disease (CD) Using a Dedicated IBD Workstation

Benjamin D Spilseth MD (Presenter); Jeff L Fidler MD *; David Bruining MD *; Stephanie Hansel MD *; William S Harmsen MD; Jordi Rimola MD *; Alan Larson; David R Holmes PhD; Joel G Fletcher MD *

PURPOSE
The MaRIA (MR Index of Activity) score is an image-based scoring system that describes the severity of Crohn’s inflammation, but multi-institutional validation is limited and prior studies used an MR enterography (MRE) protocol after rectal enema. This study evaluates the interobserver variability for MaRIA Crohn’s severity assessment using standard clinical MR enterography exams with only per oral enteric contrast and a dedicated IBD computer workstation.

METHOD AND MATERIALS
30 pts with suspected CD had MRE performed with per oral but not rectal contrast. Multiphase gd-enhanced images were acquired and evaluated at 3 time points (45, 75, 115 seconds) in 26/30 pts. 5 colorectal segments and 3 small bowel segments were evaluated by 2 GI radiologists using a dedicated IBD computer workstation for all MaRIA measurements and MaRIA calculation (1.5*wall thickness + 0.02* relative contrast enhancement +5*edema + 10*ulceration). When no inflammation was identified, a per segment score of 4.0 was used. Inter-class correlation coefficients (ICC) was calculated for phases of enhancement, between readers, and for different components of the MaRIA score.

RESULTS
There was near perfect agreement in MaRIA scores at the 3 phases of enhancement for each reader (ICC = 0.994, 0.995). Median MaRIA scores for the readers were similar (17.8 and 18.1), and the median difference between readers was not significant (1.2, p = 0.12). In 51 inflamed segments, there was substantial agreement in the MaRIA score (ICC 0.60; 95% CI 0.43—0.78). Interobserver agreement improved when all segments are included (ICC 0.79; 95% CI 0.73—0.84). There was substantial interobserver agreement regarding wall thickness (ICC 0.68; 95% CI 0.60—0.76) and moderate agreement for presence of ulceration (Kappa 0.48; 95% CI 0.28—0.68).

CONCLUSION
There is substantial interobserver agreement in calculating the MaRIA score to assess disease severity in CD patients who undergo routine MRE exams. MaRIA score is not significantly affected by the timing of the post contrast images. A dedicated IBD workstation facilitates semi-automated MaRIA measurement and automatic calculation.

CLINICAL RELEVANCE/APPLICATION
The MaRIA score demonstrates high interobserver agreement for quantitatively describing Crohn disease severity, supporting use of this index in research studies or in multicentric trials.

LL-GIS-TV3A Image Quality on Liver CT Based on Sinogram Affirmed Iterative Reconstruction Algorithm

Boris Schulz MD (Presenter); Boris Bodelle MD; Petra Siebenhandl; Martin Beeres MD; Firas Al-Butmeh; Claudia Freliesen; Thomas J Vogl MD, PhD

PURPOSE
To evaluate efficiency of sinogram affirmed iterative reconstruction technique, regarding noise and image quality on contrast enhanced computed tomography (CT) of the liver.

METHOD AND MATERIALS
CT examinations were performed upon 32 patients (128 slice CT, 120kV, 180mAs, activated tube current modulation, 0.6mm collimation). Each examination was reconstructed at standard filtered back projection (FBP) and 5 different SAFIRE strengths in 5mm images in transversal direction with soft tissue kernel. Image noise was defined as standard deviation (SD) of Hounsfield units (HU) in air, and signal to noise ratio (SNR) of the liver was defined as mean liver HU per liver SD. Subjective image quality was evaluated by three raters using a 5-point scale (1=non-diagnostic image quality, 5=excellent image quality).

RESULTS
Average image noise was 6.2HU (FBP), vs. 5.7HU (SAFIRE 1), vs. 5.0 (SAFIRE 2) 4.4HU (SAFIRE 3), 3.8HU (SAFIRE 4), 3.1HU (SAFIRE 5). SNR of the liver consecutively increased when using the iterative reconstruction algorithms from 8.4 (FBP) to 9.3 (SAFIRE 1) to 10.4 (SAFIRE 2) to 12.2 (SAFIRE 3) to 15.1 (SAFIRE 4) to 17.5 (SAFIRE 5). The differences in image noise and SNR of each SAFIRE-strength to FBP was statistically significant (p < 0.05).

CONCLUSION
Sinogram affirmed based iterative reconstruction technique significantly reduces image noise and increases SNR for examinations of the liver. However subjective image quality decreases with strong iterative strengths.

CLINICAL RELEVANCE/APPLICATION
Since subjective image quality decreased slightly with iterative reconstructive techniques, mild iterations are recommended to enhance image quality on liver CT.

LL-GIS-TV3A Imaging Patterns of IPMN. An Illustrated Discussion of the International Consensus Guidelines 2012 for the Management of IPMN

Naomi M Campbell MBCh (Presenter); Seth S Katz MD, PhD; Richard Kinh Gian Do MD, PhD

PURPOSE/AIM
The increasing frequency of the diagnosis of intraductal papillary mucinous neoplasm (IPMN) necessitates stratification of IPMN patients into low and high risk groups, for which follow-up or surgical evaluation will be recommended. New evidence concerning the natural history of this entity has emerged since the publication of the 2006 International consensus guidelines for the management of IPMN, prompting release of new guidelines in 2012. We aim to illustrate the imaging patterns of IPMN with emphasis on features that influence patient management.

**CONTENT ORGANIZATION**

We reviewed the imaging of patients at our institution with surgically resected IPMN, of varying histologic grade, from low grade dysplasia to invasive carcinoma. IPMN cases will illustrate the spectrum of imaging features of this entity on CT and MRI, as well as the worrisome features and high risk stigmata that influence risk stratification.

We review the follow up recommendations, both pre- and postoperatively. Emerging evidence concerning the risk of concomitant pancreatic ductal adenocarcinoma remote from the IPMN is discussed, with reference to the impact on follow up.

**SUMMARY**

The viewer of the exhibit will be able to 1. Recognize the distinguishing imaging characteristics of IPMN. 2. Identify the worrisome features and high risk stigmata that should prompt additional work-up.

**LL-GIE1244-THA • MR/PET vs. PET/CT in Rectal Cancer: A Potential Indication**

**Sasan Partovi** BS (Presenter) *; **Andres Kohan** MD *; **Karín A Herrmann** MD ; **Jose L Vercher-Conejero** MD *; **Christian Rubbert** MD *; **Peter F Faulhaber** MD *; **Raj M Paspulati** MD ; **Pablo R Ros** MD, PhD *

**PURPOSE/AIM**

MR/PET is a hybrid imaging technology which was recently introduced in the clinical arena. The MR component has a high soft-tissue contrast and reveals biological information when performing functional sequences like diffusion-weighted imaging (DWI). The PET component enables to visualize metabolism with a high sensitivity. The aim of this educational exhibit is to compare MR/PET vs. PET/CT for rectal cancer staging and to demonstrate MR/PET as a one stop approach for this clinical indication.

**CONTENT ORGANIZATION**

Current standard for rectal cancer staging: T staging with MRI. N and M staging with PET/CT
MR/PET in rectal cancer staging for T, N and M staging as one stop approach
Role of DWI for discordant cases when comparing MR/PET vs. PET/CT

**SUMMARY**

MR/PET is feasible and promising in rectal cancer patients. Originally proper staging in rectal cancer required two different imaging techniques, namely MRI and PET/CT. MR/PET offers an evolving one stop solution for staging, allowing local tumor assessment as well as adenopathy and distant metastasis. When discordance is observed between the findings of MR/PET vs. PET/CT DWI might be of help for clarification purposes. Rectal cancer could be one of the future killer applications of MR/PET. Multicenter trials in a large rectal cancer patient population are warranted.
Sequential image acquisition with state-of-the-art Time of Flight PET technology and 3Tesla MRI

Propose and discuss an appropriate integrated imaging protocol/workflow for PET/MRI in pancreatic pathology

• Whole body attenuation correction and anatomic reference
• Organ specific protocols for pancreas and liver
• Whole body PET

Pictorial review of a variety of benign and malignant pancreatic To discuss the potential benefits and incremental value of PET/MRI in pancreatic imaging over current standard of care imaging protocols

SUMMARY
Teaching points:

• Understand the technical features of pancreatic PET/MRI exams and learn how to efficiently perform PET/MRI for pancreatic pathology
• Learn about the imaging appearance of various pancreatic diseases in PET/MRI
• Identify potential benefits of PET/MRI for diagnosis and staging of pancreatic diseases

LL-GIS-TH1B • Quantitative Comparison of Dual Energy CT vs. 120kVp CT of Pancreatic Ductal Adenocarcinoma: Does DECT Improve CNR (Lesion Conspicuity)?

Priya R Bhosale MD (Presenter) ; Aparna Balachandran MD ; Ott Le MD * ; Patricia S Fox MS ; Eric Paulson ; Eric P Tamm MD

PURPOSE
To compare contrast to noise ratio (CNR) for pancreatic ductal adenocarcinoma (PDA), performed with pancreatic phase dual energy (DECT) versus 120 kVp CT.

METHOD AND MATERIALS
Seventy-eight patients underwent baseline multiphasic pancreatic protocol for PDA (40 DECT, 38 120kVp). On pancreatic phase DECT, CNR for PDA at monochromatic energies of 50, 60, 70 keV and iodine material density (IMD) images were obtained. In an analogous fashion, CNR was obtained from 120 kVp CT. The CNR was calculated as region of interest [(ROI) PDA-ROI of pancreas] / SD of pancreas. Wilcoxon signed rank and two sample tests were used to compare the quantitative measures from DECT to 120kVp. Bonferroni correction was applied.

RESULTS
IMD images provided significantly higher CNR for PDA, than any of the other DECT energies (p<0.05). DECT IMD images provided significantly higher CNR for PDA. Compared to standard 120kVp, each of the DECT energies provided significantly higher CNR for PDA than 120kVp. Such results indicate DECT improves lesion conspicuity of PDA compared to routine 120kVp CT.

CLINICAL RELEVANCE/APPLICATION
DECT with its high CNR may help in better detection and localization of pancreatic ductal adenocarcinoma

LL-GIS-TH2B • Localization of Liver Tumors according to the Couinaud Segmentation: Results of an Innovative Computer Aided Method

Mohammed A Alshaikh (Presenter) ; Muller Arnaud ; Capucine Miclo ; Elsa Guillot ; Pierre-Jean Valette MD

PURPOSE
To evaluate the performance of a semi-automatic liver segmentation software (Philips, Intellispace Portal) according to the anatomic Couinaud model. The software proceeds by automatic delineation of the liver contour, followed by manual identification of 9 easily recognizable anatomical (vascular and ligamentous) landmarks, and then provides visual representations of the segments

METHOD AND MATERIALS
Prospective study consisting of localizing 180 tumors into 42 liver enhanced CT scans (336 hepatic segments). Images were analyzed by 4 observers divided in 2 groups: 1-two juniors (3rd year of medicine school) unaware of the Couinaud model and using the software, 2-two seniors (over 5 years experience in abdominal imaging) without the software. In addition, a gold standard was established by an expert in abdominal imaging supported by the software and taken as adjudicator. Kappa statistics tests were used to calculate interobserver agreement between participants into each group (reproducibility), and also the probability of agreement between groups of readers and adjudicator (precision)

RESULTS
1-Kappa values were 0.84 between juniors and 0.88 between seniors indicating a very good reproducibility into each group. 2-Kappa values ranged from 0.80 to 0.81 (substantial to almost perfect agreement) between juniors and gold standard; from 0.84 to 0.91 (almost perfect agreement) between seniors and gold standard. 3-Probability of agreement between all observers and gold standard decreased for some localization: tumors located S1, S2, S6 for juniors and in S3 for seniors. 4-Probability of agreement was independent of tumor size

CONCLUSION
The concept of liver segmentation based on few landmarks easily recognizable by any CT reader provides adequate and reproducible localization of tumors into the liver. Such approach may be useful for non expert radiologists while facilitating visual representation and treatment planning for surgeons

CLINICAL RELEVANCE/APPLICATION
The proposed computer aided method provides simple anatomical liver segmentation and helps non expert radiologist for better localization of liver tumors aiming to facilitate surgical treatment plans.

LL-GIS-TH3B • MR Prediction of Tumor Grade in Rectal Cancer Using Chemical Exchange Saturation Transfer Imaging

Akihiro Nishie MD (Presenter) ; Yoshiaki Asayama MD ; Yasuo Ushijima MD ; Yukihisa Takayama MD * ; Nobuhiro Fujita MD, PhD ; Hiroshi Honda MD ; Dai Shimamoto ; Osamu Togao MD, PhD ; Takashi Yoshiura MD, PhD ; Makoto Obara * ; Jochen Keupp PhD

PURPOSE
To elucidate if chemical exchange saturation transfer (CEST) imaging can predict tumor grade of rectal cancer and to investigate the feasibility of this new MR sequence for predict malignant potential

METHOD AND MATERIALS
A total of ten patients with rectal cancer who underwent MR examination including CEST imaging were enrolled. CEST imaging was scanned with single-shot 2D TSE-DRIVE on a 3T clinical scanner (Achieva TX 3.0T, Philips Healthcare, NL) using a 32-channel SENSE Torso/Cardiac coil and 2-channel parallel transmission. The sequence parameters were as follows: Tsat=0.5 s, TR/TE=5000/6 ms, FOV=230 mm2, spatial resolution=1.8×1.8×5 mm3, 25 saturation frequency offsets S(O), O = -6.0 to +6.0 ppm (step 0.5 ppm) and S0 (O=-160 ppm), affording 2 minutes scanning time. B0 correction was also performed. MTR asymmetry (MTRosym) was defined as: MTRosym = (Ssat(-offset)-Ssat(+offset))/S0, where Ssat and S0 are signal intensities on the images with presaturation pulse at -6.0 to
Emphasis on Histologic Grades

All patients with ITB and CD, who underwent CT enteroclysis/CT enterography/CT abdomen before starting treatment, were recruited in the study. Lack of literature on computed tomography (CT) in differentiating between CD and ITB. Present study was designed to compare CT features of ITB and CD, and develop a predictive model to differentiate ITB and CD.

RESULTS

The mean APT signal of well-differentiated adenocarcinoma (n=2; 0.15±0.05%) was significantly lower than those of well- to moderately and moderately differentiated adenocarcinomas (n=3; 2.57±0.22% and n=5; 2.24±0.50%)(p<0.001). CEST imaging can predict tumor grade of rectal cancer non-invasively.

CONCLUSION

CEST imaging describes high ability to synthesize protein of cancer and may enable us to quantify tumor malignancy and proliferative potential. APT signal can be a new imaging biomarker of cancer.

LL-GIS-TH6B • First In-patient MR-Visualisation of Polymer-based Mesh Implants Used for Surgical Hernia Treatment

Nicolas Kuehnert MD (Presenter); Saurabh Kedia MD; Devasenathipathy Kandasamy MD; Suk Kim MD; Ji Eun Jo; Ji Hyun Bae MD; Tae Un Kim; Jihyun Bae MD; Jihyun Bae MD; Jihyun Bae MD; Jihyun Bae MD; Saurabh Kedia MD

PURPOSE

Surgical hernia treatments using polymer based mesh implants are one of the most frequent operations worldwide. As the implants are invisible using conventional imaging methods, iron-oxides were integrated into the mesh polymer base material to visualize them in MRI. The purpose of this study is to evaluate the conspicuity of these mesh implants in patients treated for inguinal hernia and assessment of immediate post surgical mesh configuration.

METHOD AND MATERIALS

Approved by the ethics committee, 13 patients treated with iron-loaded mesh implants via laparoscopic or via open surgical procedure were prospectively examined beginning March 2012. MRI was conducted one day after surgery at a 1.5 Tesla scanner using three different conventional gradient echo (GRE1-3) and one T2-weighted turbospin echo (TSE) sequences. Three radiologists independently assessed mesh conspicuity and diagnostic value by the following criteria using a 4-point-scale: visual contrast-to-noise ratio, conspicuity to air artifacts, and diagnostic quality rating with respect to the mesh and to the surrounding anatomy. Mesh deformation and coverage of the hernia were rated. Using linear contrast and mixed models, statistical analysis was performed.

RESULTS

MRI successfully visualized all implants. GRE sequences clearly exhibited the mesh implants as a thick hypointense line. GRE1 was rated best (3.8; p<0.001). The combination of iron-loaded implants and MRI facilitates mesh visualization for the first time in patients. After surgical hernia repair, mesh localization and configuration can be clearly assessed. For MRI protocol, we propose a combination of different gradient echo sequences and T2-weighted TSE sequences.

CONCLUSION

Using this new technique, MRI could become a non-invasive alternative to open surgical exploration if mesh-related complications after hernia surgery are suspected.

LL-GIS-TH6D • Role of CT in Differentiating Intestinal Tuberculosis from Crohn's Disease

Raju Sharma MD (Presenter); Saurabh Kedia MD; Vineet Ahuja MD; Devasenathipathy Kandasamy MD; Birendra Nagi MD

PURPOSE

Intestinal tuberculosis (ITB) and Crohn’s disease (CD) have close clinical, radiological, endoscopic, and histological resemblance. There is lack of literature on computed tomography (CT) in differentiating between CD and ITB. Present study was designed to compare CT features of ITB and CD, and develop a predictive model to differentiate ITB and CD.

METHOD AND MATERIALS

All patients with ITB and CD, who underwent CT enteroclysis/CT enterography/CT abdomen before starting treatment, were recruited in the study. The gold standard for diagnosis of CD and ITB were ECCO guidelines and Paustian’s criteria respectively. The CT images were evaluated by 2 independent observers who were blinded to the diagnosis.
RESULTS
One hundred eleven patients were included in the final analysis (60 CD, 51 ITB, mean age 36.4±14.2 years vs 34±13.3 years, p=0.36). Significantly more patients with ITB had short segment involvement (70.6% vs 26.7%, p < 0.001), ileocecal involvement (49% vs 18.3%, p=0.001), 1cm in size (19.6% vs 1.7%), p 3 segments involved (25% vs 19.6%, p=0.138). Based on above features predictive models were developed which could differentiate ITB and CD with > 90% accuracy.

CONCLUSION
Predictive models based on combination of CT findings to differentiate CD and ITB were developed, and they achieved an accuracy of >90%.

CLINICAL RELEVANCE/APPLICATION
CT is a robust modality for differentiating Intestinal Tuberculosis from Crohn’s disease. Although overlapping findings do occur, certain combination of findings can differentiate between the two.

LL-GIS-TH7B • Percutaneous Radiologic Gastrostomy in Patients with Subtotal Gastrectomy

Young Chul Cho BS (Presenter) ; Ji Hoon Shin MD ; Ho-Young Song MD ; Jin Hyoung Kim MD ; Jung-Hoon Park RT ; Soo Hwan Kim

PURPOSE
To evaluate the technical feasibility, safety, and clinical effectiveness of percutaneous radiologic gastrostomy (PRG) in patients who had previously undergone subtotal gastrectomy.

METHOD AND MATERIALS
From April 2006 to April 2012, 19 patients were treated with two types of gastric surgery in 13 patients, subtotal gastrectomy with gastrojejunalostomy, and in 6 patients, distal gastrectomy with gastroduodenostomy. PRG procedures with one-anchor technique were attempted and the remnant stomach was punctured with a 21-gauge Chiba-needle, which was exchanged for a 6-Fr Neff catheter. For gastropexy, a single anchor was used and gastrostomy tube placement was performed through the same tract of the anchor with a 12 F Wills-Oglesby gastrostomy catheter. Technical success rate, cause of technical failure, procedure time, and complications were evaluated and compared between two surgery types.

RESULTS
PRG with the one-anchor technique was performed successfully in 10 (53%) of 19 patients. In nine technical failure, percutaneous radiologic jejunalostomy (PRJ) with same procedural technique was performed successfully. Cause of technical failure were small remnant stomach (n=3), high-lying remnant stomach (n=2), and bowels anterior to the stomach (n=4). The average procedure time was 6.35 minutes (PRG) and 13.28 minutes (PRJ). Complications after PRG (n=2) and PRJ (n=0) occurred in two patients involved pneumoperitonum requiring tube removal and massive bleeding requiring embolization. Incidence of technical failure was significantly greater in patients with subtotal gastrectomy with gastrojejunalostomy than distal gastrectomy with gastroduodenostomy (6 vs. 0, P = 0.011).

CONCLUSION
PRG with the one-anchor technique is a technical feasible, safe, and clinical effective in patients with subtotal gastrectomy. PRJ can be alternative option in patients with subtotal gastrectomy with gastrojejunalostomy or technical failure of PRG.

CLINICAL RELEVANCE/APPLICATION
PRJ can be more effective method in patients with small remnant stomach, high-lying remnant stomach, and bowels anterior to the stomach than PRG.

LL-GIS-TH8B • CT Courvoisier Sign: A Common and Comparatively Reliable CT Finding in Malignant Obstruction of the Biliary Tract

Patrick McLaughlin FFRRCSI (Presenter) ; David Tso MD ; Kevin Murphy MBBCh, MRCS ; Joseph Coyle MBBCh, MRCP ; Edward Fitzgerald MBBCh ; William Yee ; Luck J Louis MD ; Michael M Maher MD, FRCR ; Savvas Nicolaou MD

PURPOSE
The authors anecdotally observed a mild increase in attenuation value of bile within the gallbladder during CT of patients with malignant obstruction of the biliary tract. We therefore conducted a retrospective study to determine the incidence of this sign and to evaluate its sensitivity and specificity for predicting the cause of biliary obstruction.

METHOD AND MATERIALS
6,157 biliary intervention procedures were performed between January 2007 and August 2012 at a single quaterny referral hepatobiliary centre. A subgroup of 630 patients who underwent abdominal CT prior to biliary intervention procedure were selected. CT images of these patients were reviewed by 2 abdominal radiologists and all patients with biliary dilation (n=357) were included. Patients who had a prior cholecystectomy or evidence of previous biliary intervention were excluded leaving 199 patients for analysis. Objective analysis of bile attenuation was performed within the gallbladder and common bile duct using 3cm2 and 0.5cm2 regions of interest. The presence or absence of pancreatic duct dilation, gallstones or discernable cause for biliary obstruction was recorded. Electronic medical and histopathological records were queried for all patients and definitive diagnoses were found in all but 1 case.

RESULTS
CONCLUSION
We define the CT Courvoisier sign as elevated attenuation (>15HU) of bile within the gallbladder which in our cohort of 199 patients with biliary obstruction was found to be a common and reliable CT indicator of malignant biliary obstruction.

CLINICAL RELEVANCE/APPLICATION
The CT Courvoisier sign is found in approximately 40% of patients with biliary obstruction and has an 83% specificity for malignant obstruction.

LL-GIE1257-THB • Image Guided Ablation in Hepatic Malignancies: Which, Why, When and How to Do It?

Anuradha S Shenoy-Bhangle MD (Presenter) ; Avinash R Kambadakone MD, FRCR ; Raul N Uppot MD ; Ashraf Thabet MD ; Debra A Gervais MD * ; Ronald S Arellano MD

PURPOSE/AIM
Percutaneous image guided ablative therapies are increasingly used for treatment of various hepatic malignancies. Availability of various ablative technologies makes it imperative to choose the right ablation technique to achieve a successful outcome and minimize complications. The purpose of this exhibit is to provide the radiologist with a guide to ensure effective ablative treatment of hepatic malignancies.

CONTENT ORGANIZATION
1. Review the various ablative technologies for hepatic tumors including radiofrequency ablation, microwave ablation, cryoablation, and irreversible electroporation.
2. Discuss the advantages and disadvantages of each ablative technique.
3. Discuss the indications and technique for ablation of hepatic malignancies using various technologies.
4. Illustrate the various techniques by citing examples of routine and challenging cases in a pictorial review.
5. Discuss the principles of effective pre, peri and post procedure management guidelines for each ablative technology.
SUMMARY
Image guided ablation is an established minimally invasive technique associated with low morbidity being increasingly used in the management of patients with hepatic malignancies. Tailoring the most appropriate ablation technology to a particular hepatic tumor is imperative to ensure successful results.

Case-based Review of Pediatric Radiology: Pediatric Abdominal Imaging (An Interactive Session)
Thursday, 01:30 PM - 03:00 PM • S406A

MSCP53A • Congenital and Acquired Abdominal Masses in Pediatric Patients
Bernard F Lay • DO (Presenter)
LEARNING OBJECTIVES
1) Discuss a systematic approach in the imaging evaluation of abdominal masses in children. 2) Review the typical imaging appearance of selected congenital and acquired abdominal masses in the pediatric population. 3) Discuss pitfalls in the diagnostic imaging of abdominal masses in children.

MSCP53B • Abdominal Vascular Anomalies and Abnormalities in Children
Arnold C Merrow MD (Presenter) *
LEARNING OBJECTIVES
1) Discuss the basic classification scheme of pediatric vascular anomalies, including vascular neoplasms and congenital vascular malformations. 2) Review helpful clinical features and imaging findings of vascular anomalies in children. 3) Discuss other abnormalities of pediatric abdominal vessels, including thrombosis, stenosis, and aneurysms.

MSCP53C • Abdominal Trauma in Children
Peter J Strouse MD (Presenter)
LEARNING OBJECTIVES
1) Describe mechanisms of abdominal trauma in children. 2) Discuss proper imaging algorithms for pediatric trauma patients. 3) Identify optimal CT protocols for abdominal trauma in pediatric patients. 4) Describe imaging findings in pediatric abdominal trauma.

Interventional Oncology Series: Liver Metastases and Bone
Thursday, 01:30 PM - 06:00 PM • S405AB

VSIO51 • Which Ablation - Where and Why
Riccardo A Lencioni MD (Presenter)
LEARNING OBJECTIVES
1) To describe the different methods and techniques used for image-guided tumor ablation. 2) To understand the use of image-guided ablation in focal cancer therapy. 3) To understand the role of image-guided ablation with respect to surgical and medical treatments.

VSIO51-01 • IRE for Liver Metastases
Govindarajan Narayanan MD (Presenter) *
LEARNING OBJECTIVES
View learning objectives under main course title.

VSIO51-03 • Chemo ± RFA; Does RFA Provide a Benefit?
Alison R Gillams MBChB (Presenter) *
LEARNING OBJECTIVES
1) To learn the survival results for patients treated with ablation, chemotherapy and combinations of ablation and chemotherapy. 2) To learn the optimal timing of ablation and chemotherapy in different clinical situations.

ABSTRACT
Chemotherapy regimens in the 80’s and early 90’s using 5 fluorouracil (5FU) based regimens did not improve survival. They did result in a morphologic response on imaging in just 30% of patients. Median survival was about 9 months. It was not until the late 90’s with the introduction of oxaliplatin and irinotecan that a change in survival was seen. Response rates increased to 50% and the use of sequential oxaliplatin and irinotecan produced a further small increase in survival. The introduction of Cetuximab and Bevacizumab saw a further increase in response rates to approximately 75% and a further increase in survival. This improvement was further honed with the realisation that only Kras wild type patients responded and Kras testing is now routine prior to Cetuximab administration. Kras status may differ between the primary lesion and the metastatic disease but the difference is small. Median survival for patients who receive all the possible chemotherapeutic options is now approximately 21 months, 5 year survival remains exceptional. Ablation is generally used in small volume, liver only disease in inoperable patients The median survival is of the order of 36 months with 5 year survival of 30%. This is better than has been achieved with any chemotherapy regime and so ablation should be offered to all suitable patients. Adjuvant chemotherapy has been shown to be useful in post resection patients and there is some anecdotal evidence that it is useful post ablation. Neo adjuvant chemotherapy is used to downsize metastases in patients who are not initially resectable or ablable in the hope that they will become suitable for definitive treatment. Although some tumours will disappear on imaging, the chances of recurrence are very high (96%) and therefore treatment should be aimed to encompass all the original sites of disease.

VSI051-04 • Microwave Ablation (MWA) Therapy of Liver Metastases from Colorectal Carcinoma Post Systemic Chemotherapy
Nour-Eldin A Nour-Eldin MD, MSc (Presenter) ; Nagy N Naguib MSc ; Tatjana Gruber-Rouh ; Thomas Lehndert MD ; Thomas J Vogl MD, PhD

PURPOSE
to evaluate the safety, efficiency, effectiveness, and overall outcome in patients treated with microwave thermal ablation of colorectal metastases post systemic chemotherapy.

METHOD AND MATERIALS
An institutional review board-approval was obtained with informed consent of all patients. Retrospective analysis of prospective intention to treat study was performed from January 2008 to January 2013, and included 92 patients (mean age 56 years SD: 2.6) with 132 liver metastases measuring 0.7-5.0cm, who were treated with microwave ablation (MWA). Local tumor control, complications, and long-term survival were analyzed.

RESULTS
The mean follow-up period was 32.5 months. Complete ablation was achieved in 117 of 132 (88.6%) nodules. Seventeen of the 117 (14.5%) successfully treated nodules developed local recurrence. Univariate analysis showed that tumor size of < 3 cm is a significant risk factor (P = 0.04). Multivariate analysis showed that number of cycles of chemotherapy (FOLFOX) was a significant prognostic factor for overall recurrence (P=0.03), whereas disease-free interval was the significant prognostic factor for distant recurrence (P=0.03). Major complications occurred in 1.1% of patients. No procedure-related mortalities were observed. The 1, 2, 3, and 5-year overall survival rates after the initial ablation were 82, 61.2, 51.2, and 38.3%, respectively. The main cause of death was systemic tumor progression in 65.3% of the patients.

CONCLUSION
MWA is a safe and effective treatment option for patients with liver metastases from Colorectal Carcinoma post systemic chemotherapy.

CLINICAL RELEVANCE/APPLICATION
Thermal ablative techniques such as MWA are safe and effective minimally invasive therapeutic option in the management of hepatic metastases, especially after systemic chemotherapy.

VSI051-05 • Surgery for CRC Liver Mets - When Is Ablation Indicated?
Yuman Fong MD (Presenter) *

LEARNING OBJECTIVES
1) To understand the available ablative options for metastatic colorectal cancer. 2) To understand the determinants of success and failure for ablative treatment for colorectal metastases. 3) To understand the use of ablative therapy as an adjunct to surgery in the care of patients. 4) To understand the use of ablative therapy in the treatment of recurrent liver metastases.

VSI051-06 • Treatment of Difficult Liver Metastases
Thierry J De Baere MD (Presenter) *

LEARNING OBJECTIVES
1) To know what are the most difficult situations when treating liver metastasis with percutaneous ablation techniques. 2) To know tips and tricks that can help to improve quality of targeting during percutaneous ablation of liver metastases. 3) To know what are the limitations of different ablation technologies of percutaneous ablation according to tumor size and location.

ABSTRACT
Percutaneous ablation of liver metastases allows for complete ablation in approximately 90% in well selected indications. Some metastases are more difficult to ablate due to either difficulty in targeting, or their location close to large vessels, close to fragile neighboring organs, or in proximity to the liver hilum. Difficulties in targeting are often due to poor visualization of the targeted tumor with image guidance. We will present possible benefit of fusion imaging between US and enhanced CT and discuss accuracy of such techniques. We will described technique and results of tumor tagging with either percutaneously inserted metallic coils or tagging with intra-arterial injection of Lipiodol. Location close to large vessels favors convective tissue cooling and is responsible for lower rate of complete ablation with RFA for such tumor. Combining RFA with percutaneous balloon occlusion of hepatic or portal veins can improve results and the technique will be presented. Other ablative technologies can improve results of ablation close to large vessels and will be discussed namely with regards to microwaves ablation and irreversible electropropration. Neighboring organ can be preserved from any damage by using aerodissection (air or carbon dioxide) or hydrodissection (dextrose, G5%, G10%) for shielding, and tips and trick to achieve such dissection will be presented.

VSI051-07 • Assessing Geometric RF Ablation Accuracy and Predicting Outcome within 24h after Treatment by Mapping the Preprocedure Liver Lesion to the Postprocedure Ablation Zone
Frederik Vandenburgrooke MD (Presenter) ; Jef Vandemeulebroeck PhD, MSc ; Nico Buls DSc, PhD * ; Pablo R Ros MD, PhD * ; Johan De Mey *

PURPOSE
In RF ablation, complete coverage of the lesion by the ablation zone, is considered the primary indicator for treatment success. The purpose of this study was to evaluate the predictive value of early assessment of the geometrical accuracy of the procedure by using contrast enhanced CT images acquired before and within 24h after ablation.

METHOD AND MATERIALS
Twenty-three patients, with a total of 45 liver lesions, received a CT scan before and 24 hours after RF ablation. Follow up PET/CT scans
METHOD AND MATERIALS
To report the effectiveness and mid-term outcome of percutaneous image-guided cryoablation on extra-abdominal desmoid tumors.

RESULTS
Eleven lesions (24.4%) showed LTP during a mean follow up of 62 weeks. Registration was successful for all lesions, although 5 were perceived as challenging. Based on the registered images, 29 lesions were completely covered by the ablation zone, while 10 were not. For 6 lesions, the edge was found to coincide with the edge of the ablation zone. Incomplete coverage of the lesion was found to be a powerful predictor for LTP (Se = 100%, Sp = 85%, PVV = 69%, NPV = 100%). Interestingly, two lesions only showed LTP after 5-6 months, and both belonged to the group were the edges of lesion and ablation zone coincided.

CONCLUSION
Verifying the coverage of liver metastases by an ablation zone through registration of pre- and early post-ablation CT images is feasible and has a strong predictive power for treatment outcome. Increasing the robustness and degree of automation of the procedure could further improve the accuracy and reproducibility of the method.

CLINICAL RELEVANCE/APPLICATION
Early and accurate detection of RF ablation failure may allow for reablation and will ultimately improve the efficacy of this minimally invasive procedure.

VSIO51-08 • Liver Metastases Tumor Board
Matthew R Callstrom MD, PhD (Presenter) *

LEARNING OBJECTIVES
1) Describe the characteristics of liver metastases amenable to interventional onologic treatment. 2) Describe new techniques for the percutaneous treatment of liver metastases. 3) Understand the role of percutaneous ablation for treatment of liver metastases in the context of other treatments including surgery and radiation oncology.

ABSTRACT
VSIO51-09 • Surgery vs Ablation for Bone Tumors
Peter Rose MD (Presenter)

LEARNING OBJECTIVES
1) To understand the factors that decide whether a lesion is best treated with surgery or ablation.

VSIO51-10 • SBRT for Bone and Soft Tissue Metastases
Kenneth R Olivier MD (Presenter)

LEARNING OBJECTIVES
1) Review the technique of Stereotactic Body Radiotherapy. 2) Discuss cases where SBRT has been used in soft tissue and non-spine bone metastases. 3) Review literature and Mayo Clinic experience with SBRT in these situations. 4) Discuss opportunities for collaboration with Interventional Radiology in complex patients.

ABSTRACT
Stereotactic Body Radiotherapy (SBRT) is a useful treatment modality for solitary metastases in many locations. SBRT has been used more recently for spinal metastases with good results. The use of SBRT for non-spine bone metastases is not as widely reported, but can be useful in certain situations. Mayo Clinic has been treating select patients with SBRT and the experience will be discussed.

VSIO51-11 • Soft Tissue Cryoablation Is Crucial for Patients with Oligometastatic Disease
Peter J Littrup MD (Presenter) *; Hussein D Aoun MD; Barbara A Adam MSN; Evan N Fletcher MS, BA; Mark J Krycia BS

PURPOSE
To assess whether diverse tumor location(s) show differences in local cryoablation outcomes of cancer control, morbidity, and ablation volume reduction for many soft tissue tumor types. We hypothesize that non-organ cryoablation locations respond similarly in terms of recurrence, complication and/or healing rates, regardless of anatomic location and tumor type.

METHOD AND MATERIALS
220 CT and/or US-guided, percutaneous cryotherapy procedures were performed for 251 oligometastatic tumors from multiple primary cancers in 126 patients. Tumor location was grouped according to regional sites: retroperitoneal, superficial, intraperitoneal, bone, and head and neck. PCA complications were graded according to Common Terminology Criteria for Adverse Events Version 4.0 (CTCAE). Local tumor recurrence and resorption was calculated from ablation zone measurements, grouped into 1-, 3-, 6-, 12-, 18- and >24-month statistical bins.

RESULTS
Tumor and procedure numbers for each site are: 75, 69 - retroperitoneal; 76, 62 - superficial; 39, 32 - intraperitoneal; 34, 34 - bone; and 27, 26 - head and neck. Average diameters of tumor and visible ice during ablation were 3.4 and 5.5 cm, respectively. Major complications (CTCAE Grade >3) occurred after 7 procedures (3.2%). At 11 months average follow-up (range: 0-82), 10% local recurrence rates (26/251) were noted, of which 3 occurred within the ablation zone for a PCA procedural failure rate of 1.2%. Average time to recurrence was 4.9 months. At 21 months following the procedure, the initial ablation zone had reduced in volume by 93%.

CONCLUSION
Early and accurate detection of RF ablation failure may allow for reablation and will ultimately improve the efficacy of this minimally invasive procedure.

CLINICAL RELEVANCE/APPLICATION
Oligometastatic disease is becoming widely recognized with improved systemic treatments. Soft tissue cryoablation contributes to improved cancer-specific survival for many tumor types, despite loco-regional spread.

VSIO51-12 • Mid-term Outcome of Percutaneous Image-guided Cryoablation on Inoperable Extra-abdominal Desmoid Tumors
Marion Havez (Presenter); Francois Cornelis MD; Paul Sargos; Sultan Al Ammari; Agnes Neuville; Eberhard Stoeckle; Michele Kind MD; Antoine Italiano MD

PURPOSE
To report the effectiveness and mid-term outcome of percutaneous image-guided cryoablation on extra-abdominal desmoid tumors.

METHOD AND MATERIALS
Cryoablation was technically possible for all lesions under general (n=15) or local (n=2) anesthesia. Two probes were used in mean (range: 1-4) per procedure. Mean follow-up was 14.1 months (4–27 months). The disease-free survival rates based on clinical evaluation were 100%, 92% and 73% at 6, 12 and 24 months, respectively. The rates of local tumour progression based on RECIST criteria were 0% at 6, 12 or 24 months. However, 10 patients (59%) presented asymptomatic residual tumors surrounding the ablative site on imaging follow-up. The major complications rate was 5.8% per session (1/17).

CONCLUSION

Despite high rate of partial ablation, percutaneous image-guided cryoablation appears to be safe and effective for mid-term local control in case of inoperable extra-abdominal desmoid tumors.

CLINICAL RELEVANCE/APPLICATION

Cryoablation is a well-tolerated technique according to mid-term results. Mid-term efficacy of cryoablation was close to that of formal conservative surgery.

VSIO51-13  •  MRgFUS for Palliation of Painful Metastatic Disease

Mark D Hurwitz MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO51-14  •  Cementoplasty Beyond the Spine

Giovanni Carlo Anselmetti MD (Presenter) *

LEARNING OBJECTIVES

1) To learn indications and contra-indications to cementoplasty beyond the spine. 2) To learn the optimal technique, regarding materials and image guiding systems, in performing percutaneous cementoplasty.

ABSTRACT

Bone is one of the most frequent sites of spread for many common cancers. In such case, when appropriate systemic treatment for the underlying cancer fails, patients should be considered for specific treatment, the principal modalities being radiotherapy and bisphosphonates. These therapies leave approximately one third of cases with inadequate pain control. This failure prompted the search for other strategies aimed at bone pain control through local bone augmentation such as percutaneous cementoplasty (PC). PC can be performed under combined Computed Tomography (CT) and Fluoroscopic guidance; flat panel angiographic suite with integration CT can also be used. Both systems allow precise positioning of the needle within the bone lesion. Most frequently PC is executed in sacrum, hip and femur but this procedure is also successful and feasible in fingers, astragalus, calcaneus, ribs, sternum, etc. Local anesthesia is employed in most cases.

Bone lesions are localized on CT and the most adequate access point is identified. A dedicated vertebroplasty beveled needle is then advanced into the bone lesion. Bone cement is injected under continuous fluoroscopic control. After PC a CT scan of the treated region is carried out to assess the extent of lesion filling and to visualize possible PMMA leaks.

Patients are discharged the same procedural day.

In our experience PC was technically successful in all cases with no immediate severe complications. In lesions with lost integrity of the cortical bone, asymptomatic leakage of PMMA in the soft tissues can occur but, normally, it does not require any treatment. Delayed complications such as fractures in metastases of the femoral diaphysis can occur; lytic lesions of the long bones should not be treated with PC due to high risk of fracture during ambulation. PC, in our opinion, should be proposed in all patients with painful or invalidating bone lesions when conventional therapies fail or surgery is not feasible.

VSIO51-15  •  Chondrolysis and Femoral Head Osteonecrosis: A Complication of Periacetabular Cryoablation

Michael V Friedman MD (Presenter) ; Jack W Jennings MD ; Travis J Hillen MD * ; Daniel E Wessell MD, PhD *

PURPOSE

Cryoablation is an emerging alternative in the treatment of primary osseous malignancies or metastatic diseases that are not amenable to more conventional therapies. As experience compounds with this newer, less-invasive technique, associated complications will be continually defined. We describe a novel complication associated with percutaneous cryoablation of periacetabular bone tumors.

METHOD AND MATERIALS

Between 2008 and 2013, 41 patients with a total of 100 musculoskeletal lesions were treated by cryoablation at our institution. 12 patients were referred to our department specifically for treatment of periacetabular osseous malignancies. There were a total of 15 lesions, with 3 of the 12 patients having bilateral lesions. Follow-up clinical notes and imaging of the patients were retrospectively reviewed for a minimum of 2 months. Generalized estimating equations were performed to assess the effect that patient demographics and treatment parameters (including ablation time, cycle distribution, and probe proximity to the femoral head and fovea) had on development of chondrolysis and osteonecrosis.

RESULTS

Chondrolysis or femoral head osteonecrosis developed in 31% (4 of 13) of periacetabular lesions. Of the remaining patients with non-periacetabular lesions that underwent cryoablation, none subsequently developed osteonecrosis. Patients who developed chondrolysis or osteonecrosis had lesion zones closer to the joint. There was no difference in ablation times or cycle distribution. Chondrolysis or osteonecrosis developed within a 5 month period, with a mean of 89 days. 3 of the 4 patients who developed chondrolysis or osteonecrosis had undergone total joint replacement.

CONCLUSION

Chondrolysis or femoral head osteonecrosis developed in 31% of periacetabular malignancies treated by cryoablation, ultimately requiring joint replacement in 3 of 4 patients. Careful pre-ablation planning and risk/benefit analysis should be considered before performing periacetabular cryoablation, and patients should subsequently be monitored for developing chondrolysis.

CLINICAL RELEVANCE/APPLICATION

Periacetabular cryoablation can be associated with osteonecrosis and chondrolysis, and therefore, careful pre-ablation planning and risk/benefit analysis should be performed prior to proceeding.

VSIO51-16  •  Percutaneous Image-guided Ablation of Metastatic Renal Cell Carcinoma

Brian T Welch MD (Presenter) ; Matthew R Callstrom MD, PhD * ; Jonathan M Morris MD ; Anil N Kurup MD ; Grant D Schmit MD ; Thomas D Atwell MD ; Adam J Weisbrod MD ; Manish Kohli MD ; Brian Costello MD ; Christine Lohse ; Stephen Boorjian ; Robert Thompson MD
PURPOSE
Over 65,000 new cases of RCC will be diagnosed this year in the United States. Approximately 50% of RCC patients will present with or subsequently develop metastases after primary treatment. Our purpose is to assess the safety, local control, complications, and adjunctive survival of ablation in treatment of mRCC in this selected cohort.

METHOD AND MATERIALS
A retrospective review was performed of 61 patients who underwent 74 ablation procedures to treat 82 mRCC lesions with intent of local control (i.e. not palliative). Technical success, safety, local control, complications, and survival were analyzed according to standard criteria.

RESULTS
Four (4.9%) technical failures were observed. Time to recurrence was assessed for the subset of 76 (93%) tumors that were followed past ablation. Six (7.9%) tumors recurred at a mean of 1.6 years following ablation (median 1.4; range 0.6 - 2.9). The mean duration of follow-up for the 70 tumors that did not recur was 1.9 years (median 1.2; range 10 days - 7.5 years). Estimated local recurrence-free survival rates (95% CI; number still at risk) at 1, 2, 3, 5, and 7 years following ablation were 94% (88 • 100; 41), 94% (88 • 100; 32), 83% (70 • 97; 17), 83% (70 • 97; 5), and 83% (70 • 97; 3), respectively. Estimated overall survival rates (95% CI; number still at risk) at 1, 2, 3, 5, and 7 years following ablation were 87% (79 • 97; 42), 83% (73 • 94; 31), 76% (63 • 90; 19), 52% (35 • 76; 6), and 52% (35 • 76; 2), respectively. Recognizing this highly selected patient population and additional concurrent or subsequent treatment, estimated cancer-specific survival rates (95% CI; number still at risk) at 1, 2, 3, 5, and 7 years following ablation were 91% (83 • 99; 42), 86% (76 • 96; 31), 82% (71 • 95; 19), 62% (46 • 85; 6), and 62% (46 • 85; 2), respectively. Four (5%) CTCAE grade 3 or greater complications were observed; there were no deaths related to the ablation.

CONCLUSION
Image guided ablation of mRCC is a relatively safe procedure with acceptable local control rates. In carefully selected patients, adjunct ablation with systemic therapy, radiation, and surgery may confer a survival benefit, although further follow-up and validation are needed.

CLINICAL RELEVANCE/APPLICATION
In carefully selected patients, adjunct ablation with systemic therapy, radiation, and surgery may confer a survival benefit, although further follow-up and validation are needed.

VSIO51-17 • Bone Metastases Tumor Board
Matthew R Callstrom MD, PhD (Presenter) *

LEARNING OBJECTIVES
1) Describe the characteristics of bone tumors amenable to interventional oncologic treatment in the context of other treatments including surgery and radiation oncology. 2) Describe the techniques to avoid complications in the percutaneous treatment of metastatic bone tumors. 3) Describe characteristics of metastatic bone tumors that benefit from combination treatments.

Hot Topic Session: MR Quantification Techniques in the Liver (Fat, Iron, Fibrosis)
Thursday, 03:00 PM - 04:00 PM • E350

SPSH52 • AMA PRA Category 1 Credit ™: 1 • ARRT Category A+ Credit: 1
Moderator
Claude B Sirlin, MD *

SPSH52A • MR Quantification of Liver Fat
Scott B Reeder MD, PhD (Presenter)

LEARNING OBJECTIVES
1) Understand the relative accuracy and performance of US, CT and MRI for the detection and quantification of hepatic steatosis. 2) Understand the fundamentals of emerging confound-corrected MRI methods to quantify liver fat content.

SPSH52B • MR Quantification of Liver Iron
Diego Hernando PhD (Presenter)

LEARNING OBJECTIVES
1) Understand the fundamentals of MR methods to quantify liver iron. 2) Understand the main advantages and disadvantages of different methods.

ABSTRACT
Assessment of liver iron levels is necessary for detection and quantitative staging of iron overload, and monitoring of iron-reducing treatments. This lecture discusses the need for non-invasive assessment of liver iron, and reviews qualitative and quantitative methods with a particular emphasis on MRI. Methods that are in clinical use, as well as their limitations, are described. Remaining challenges, unsolved problems, and recently introduced techniques to provide improved characterization of liver iron deposition are discussed.

SPSH52C • MR Quantification of Liver Fibrosis
Richard L Ehman MD (Presenter) *

LEARNING OBJECTIVES
1) Briefly review different MR-based techniques to evaluate liver fibrosis. 2) Understand the fundamentals of MR elastography. 3) Understand the performance of MR elastography for evaluating liver fibrosis.

Hot Topic Session: Clinical 'Killer Applications' for Spectral CT
Thursday, 03:00 PM - 04:00 PM • S403B
LEARNING OBJECTIVES
1) Understand the advantages of using spectral CT over conventional CT. 2) Learn about state-of-the-art clinical applications of spectral CT. 3) Assess future potential applications of spectral CT to clinical practice.

SPSH56A • The Physics behind Spectral CT - What Is Possible Today and Tomorrow?
Mats Danielsson PhD (Presenter) *

LEARNING OBJECTIVES
View learning objectives under the main title.

SPSH56B • Thoracoabdominal Material Specific Vascular Imaging
Ioannis Vlahos MRCP, FRCR (Presenter) *

LEARNING OBJECTIVES
View learning objectives under the main title.

SPSH56C • Characterization of Fat Using Dual Energy
Anders Persson MD, PhD (Presenter)

LEARNING OBJECTIVES
View learning objectives under the main title.

SPSH56D • Killer Applications of Dual-Energy CT in the Abdomen
Dushyant V Sahani MD (Presenter)

LEARNING OBJECTIVES
View learning objectives under the main title.

Case-based Review of Pediatric Radiology: Pediatric Pelvis Imaging (An Interactive Session)
Thursday, 03:30 PM - 05:00 PM • S406A

MSCP54 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5
Director
Edward Y Lee , MD, MPH

MSCP54A • Congenital and Acquired Scrotal Lesions in Children
Angelisa M Paladin MD (Presenter)

LEARNING OBJECTIVES
1) Review helpful clinical aspects and imaging characteristics of congenital and acquired scrotal lesions in children. 2) Learn characteristic imaging findings to narrow the differential of scrotal tumors.

MSCP54B • Adnexal Masses in Pediatric Patients
Mary R Wyers MD (Presenter)

LEARNING OBJECTIVES
1) Discuss imaging modality choices for evaluating the pediatric female pelvis. 2) Review characteristic imaging findings of adnexal masses in children and discuss differential diagnoses of various lesions which will be presented. 3) Discuss work up and management of adnexal masses in children.

MSCP54C • Bowel Disorders in Pediatric Population
Michael S Gee MD, PhD (Presenter)

LEARNING OBJECTIVES
1) Review the pathophysiology and characteristic imaging features of pediatric bowel disorders. 2) Discuss the pros and cons of different imaging modalities for evaluating bowel disorders in young patients.

Gastrointestinal: Biliary Imaging (An Interactive Session)
Thursday, 04:30 PM - 06:00 PM • E353C

RC709 • AMA PRA Category 1 Credit ™:1.5 • ARRT Category A+ Credit:1.5

RC709A • Biliary and Gall Bladder Malignancies
Richard M Gore MD (Presenter)

LEARNING OBJECTIVES
1) Understand the prevalence and risk factors for gallbladder and biliary malignancies. 2) Review the imaging features of these malignancies. 3) Describe the staging system for followup of these neoplasms. 4) Make recommendations to improve the early detection of these clinically elusive tumors.

ABSTRACT
GALLBLADDER CARCINOMA Carcinoma Manifesting as Mural Thickening Focal or diffuse thickening of the gallbladder wall is the least common presentation of gallbladder carcinoma and is the most difficult to diagnose, particularly in the early stages. Gallbladder carcinoma may cause mild to marked mural thickening in a focal or diffuse pattern. This thickening is best appreciated on sonography, in which the gallbladder wall is normally 3 mm or less in thickness. Carcinomas confined to the gallbladder mucosa may present as flat or slightly raised lesions with mucosal irregularity that are difficult to appreciate sonographically. In one sonographic series, half the patients with these early carcinomas had no protruding lesions, and fewer than one third were identified preoperatively. More advanced gallbladder carcinomas can cause marked mural thickening, often with irregular and mixed echogenicity. The gallbladder may be contracted, normal sized, or distended, and gallstones are usually present. Carcinoma Manifesting as a Polypoid Mass About one fourth
gallbladder carcinomas manifest as a polypoid mass projecting into the gallbladder lumen. Identification of these neoplasms is particularly important because they are well differentiated and are more likely to be confined to the gallbladder mucosa or muscularis when discovered. On ultrasound images, polypoid carcinomas usually have a homogeneous tissue texture, are fixed to the gallbladder wall at their base, and do not cast an acoustic shadow. Most are broad based with smooth borders, although occasional tumors have a narrow stalk or villous fronds. The polyp may be hyperechoic, hypoechocic, or isoechoic relative to the liver. Gallstones are usually present, and the gallbladder is either normal sized or expanded by the mass. A small polypoid carcinoma can be indistinguishable from a cholesterol polyp, adenoma, or adherent stone. Most benign polyps are small, measuring less than 1 cm. If a gallbladder polyp is...
LEARNING OBJECTIVES
1) Describe an appropriate imaging work up for malignant bile duct obstruction (MBDO). 2) List the indications for percutaneous biliary intervention in the setting of MBDO. 3) Formulate a plan to achieve clinical goal of drainage based on imaging and clinical data. 4) Understand potential complications of biliary drainage in MBDO and their management.

ABSTRACT
BILIARY COMPLICATIONS FOLLOWING ORTHOTOPIC LIVER TRANSPLANTATION

Roy Gordon MD, Interventional Radiology, University of California, San Francisco

Transplant patients are different for a number of reasons as listed below:
- Most liver transplant patients have benign disease and a potential for long-term survival
- Resources (livers and financial) are limited, so every effort must be made to salvage the transplanted liver
- Immunosuppression alters both response to infection and the healing process

Participants in this course will learn about the incidence, nature and management of biliary complications following liver transplantation both from the diagnostic and the therapeutic approach. The following questions will be addressed:
1. Should bile leaks be treated surgically or non-operatively?
2. Should anastomotic strictures be treated surgically or dilated?
3. How should non-anastomotic strictures be managed? In addition some other biliary problems in the liver transplant recipient will be presented detailing diagnosis and management

- Bile duct filling defects
- Sphincteric dysfunction
- Mucocoele of cystic duct remnant
- Problems related to split livers (living donors)

PERCUTANEOUS INTERVENTION IN MALIGNANT BILIARY OBSTRUCTION -- ANNE COVEY MD

PSIR INDICATIONS FOR BILIARY DRAINAGE

- Biliary sepsis
- Intractable pruritus
- Lower bilirubin for chemotherapy
- Biliary diversion (leak)
- Improve QOL

INDICATION FOR PERCUTANEOUS DRAINAGE MBO

- Failed endoscopy
- High obstruction
- Obstructed Roux loop
- Access for additional therapies (stone removal, dilation, brachytherapy)

PRE PROCEDURE WORK UP IMAGING

- Obstructive vs. non obstructive jaundice
- Level of obstruction
- Portal vein status
- Atrophy
- Parenchymal lesions
- Ascites
- Liver anatomy

LABS

1. Platelet count
2. INR
3. LFTs

PROCEDURE ISSUES

1. Right vs left drain
2. Atrophy/portal vein compromise
3. Ascites
4. Catheter vs stent
LEARNING OBJECTIVES
1) Select among varying imaging techniques to optimize the appropriate study for the patient. 2) Recognize classic and subtle signs of radiologic pathology, and avoid some common pitfalls and errors.

ABSTRACT
The Abdominal Top 10 Countdown is an interactive audience response based presentation in which 10 unknown abdominal cases from the emergency department will be presented. The participants are encouraged to interact with the cases. The salient features of the cases are then illustrated along with more complex imaging modalities, if appropriate. The interactive nature will challenge the learners' skill and knowledge applications.

RC808C • Musculoskeletal Top 10 Countdown
Manickam Kumaravel MD, FRCR (Presenter)

LEARNING OBJECTIVES
1) Analyze varying imaging techniques and will be able to apply this knowledge to improve effective patient care. 2) Be proficient in scrutinizing subtle radiographic signs in musculoskeletal presentations in the emergency department and in understanding the use of more complex imaging techniques to ascertain the underlying pathology.

ABSTRACT
The Top 10 countdown is an interactive audience response based system in which 10 unknown Musculoskeletal cases from the emergency room will be presented. The participants are encouraged to interact with the cases. The salient features of the cases are then illustrated along with more complex imaging modalities, if appropriate. The interactive nature will challenge the learners' skill and knowledge applications.

Gastrointestinal: Imaging the Obese Patient (An Interactive Session)
Friday, 08:30 AM - 10:00 AM • S402AB

RC809 • Challenges and Solutions in Imaging the Obese Patient
Rajan T Gupta MD (Presenter) *

LEARNING OBJECTIVES
1) Identify and understand the challenges in imaging the obese patient. 2) Determine how to alter CT parameters in order to optimize imaging in this patient population. 3) Explore the other imaging modalities that can be used to detect and characterize disease processes in the obese patient.

ABSTRACT
RC809B • Bariatric Surgery I: Overview and Roux-En-Y Gastric Bypass
Courtney A Coursey MD (Presenter) *

LEARNING OBJECTIVES
1) Describe indications for bariatric surgery. 2) Identify expected post-operative changes following bariatric surgical procedures. 3) Identify complications following bariatric surgical procedures.

RC809C • Bariatric Surgery II: Laparoscopic Gastric Banding
Christine O Menias MD (Presenter)

LEARNING OBJECTIVES
1) Familiarize the Radiologist with the Laparoscopic Gastric Band Apparatus. 2) Understand normal post procedure imaging of Laparoscopic Gastric Band. 3) Recognize potential complications with imaging.

Right Upper Quadrant Ultrasound
Friday, 08:30 AM - 10:00 AM • E351

RC810 • Sonography of Focal Liver Lesions
Mitchell E Tublin MD (Presenter)

LEARNING OBJECTIVES
1) Describe a practical approach for the characterization of liver lesions at ultrasound. 2) Illustrate useful imaging features of typical and atypical hemangiomas. 3) Demonstrate the potential use of ultrasound contrast agents for liver mass characterization.

ABSTRACT
Despite improvements in ultrasound technology, the approach to characterization of liver lesions at ultrasound has changed little over the past thirty years. A recommendation for further evaluation by either MRI or CECT is typically given, though in many cases, the ultrasound features (in combination with clinical history) are sufficient for diagnosis. Microbubble contrast agents may improve ultrasound diagnostic specificity in the near future.

RC810B • Liver Elastography
Thomas H Grant DO (Presenter)

LEARNING OBJECTIVES
1) What are these techniques. 2) When should they be used. 3) How effective are they. 4) Future innovations.

ABSTRACT
Noninvasive assessment of liver fibrosis is challenging given that chronic liver disease affects hundreds of million patients worldwide. Fibrosis is reversible with effective intervention. Therefore an effective, relatively fast method to detect fibrosis is essential.
LEARNING OBJECTIVES
1) Discuss the value of ultrasound when evaluating the gallbladder and bile ducts. 2) Identify the imaging features of acute conditions of these structures and complications. 3) Recognize common pitfalls to avoid misinterpretation. 4) Describe other conditions of the gallbladder and bile ducts including adenomyomatosis, sclerosing cholangitis, gallbladder cancer and cholangiocarcinoma.

**Interactive Game: Clinical Problems in Body MRI - Case-based Instruction**

**Friday, 08:30 AM - 10:00 AM • E451B**

**RC829 • AMA PRA Category 1 Credit ™•1.5 • ARRT Category A+ Credit:1.5**

LEARNING OBJECTIVES
This interactive session will use RSNA Diagnosis Live. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

**RC829A • Liver Lesion Differential Diagnosis**

Christopher G Roth MD (Presenter) *

LEARNING OBJECTIVES
1) To appreciate and understand the typical imaging appearances of common liver lesions. 2) To understand the algorithmic approach to liver lesion differential diagnosis. 3) To understand how information from the various pulse sequences and contrast agents contribute to liver lesion assessment.

ABSTRACT
Given the ubiquitousness of liver lesions on imaging studies, it is incumbent upon radiologists to accurately characterize these lesions and differentiate benign from malignant. While the vast majority of liver lesions are benign incurring no further treatment or management and their features need to be recognized, the management of indeterminate and malignant lesions ranges from percutaneous biopsy to surgery and chemotherapy. A confident diagnosis should be pursued before invasive measures are undertaken. While many lesions are adequately characterized on other imaging modalities, many require further analysis with MRI and some may initially present at MR imaging. Given the wide array of pulse sequences and protocols and proliferation of MR contrast agents, assimilating all of the necessary imaging information to generate an accurate diagnosis or differential diagnosis can be challenging.

MRI is considered the most comprehensive and accurate imaging modality for the noninvasive assessment of liver lesions. In the majority of cases, a confident lesion diagnosis is possible based on the composite information from multiple pulse sequences. While many lesions exhibit classic features rendering diagnosis straightforward, lesions occasionally demonstrate unusual or atypical features that may complicate accurate diagnosis and familiarity with these infrequent appearances is important for accurate characterization and discrimination between benign and malignant etiology. The utility of the various MRI pulse sequences and contrast agents will be discussed and a diagnostic algorithm will be presented to help classify and accurately diagnose liver lesions.

**RC829B • Pancreatic Cysts - Achieving Consistency and Common Sense**

Masoom A Haider MD (Presenter) *

LEARNING OBJECTIVES
1) To be able to perform an MRI protocol for evaluation of pancreatic cystic lesions. 2) To recognize the classic MRI findings for cystic pathologies of the pancreas. 3) To have a pragmatic approach to management recommendations of cystic lesions of the pancreas.

ABSTRACT
With the widespread use of cross sectional imaging cystic pancreatic lesions are being detected with increasing frequency. The dominance of pseudocyst as the commonest type of pancreatic cyst may no longer hold. Radiologists must be familiar with the features of cystic neoplasms. MRI offers excellent tissue contrast for characterization of pancreatic cysts as well as for assessment of relationship to the pancreatic duct which can be helpful for differential diagnosis. A number of MRI features can be used to help guide management and offer likely differential diagnosis and will be presented. At the same time, MRI has resulted in increased detection of tiny incidental simple pancreatic cysts for which limited or no followup may be necessary. It is important to recognize that in some cases MRI and other non-invasive imaging methods cannot provide reliable diagnosis as there is substantial overlap in imaging findings between some benign and pre-malignant or malignant cystic neoplasm. These scenarios will be reviewed.

**RC829C • Cholangiocarcinoma - Addressing a Difficult Challenge**

Kartik S Jhaveri MD (Presenter) *

LEARNING OBJECTIVES
1) To emphasize an optimal MR imaging protocol. 2) To highlight role of MRI in the diagnosis and classification. 3) To demonstrate the role of MRI in staging. 4) To understand limitations of MRI and review mimics of cholangiocarcinoma.

ABSTRACT
Although Cholangiocarcinoma is a rare tumour (...
ABSTRACT

Advanced imaging modalities in the detection of tumors and for monitoring treatment response.

RESULTS

The differences for categorical variables. A p-value of 0.05 was considered significant.

CONCLUSION

DECT significantly improves the visibility of early bowel ischemia compared to conventional CT images. DECT may offer earlier and more confident diagnosis of bowel ischemia, especially in the absence of late secondary signs. It may increase the sensitivity and specificity of CT for bowel ischemia.

CLINICAL RELEVANCE/APPLICATION

Evaluation of engorgement of mesenteric vein and enhancement of wall and mesenteric vessels would help us to predict bowel ischemia or necrosis in the closed-loop small bowel obstruction.

METHOD AND MATERIALS

Thirty-five patients with CL-SBO confirmed by laparotomy (n = 34) or multiplanar reconstruction of thin slice CT images (n = 1) were included. On the basis of the surgical findings, these patients were classified into three groups: necrosis group, (n = 16) and ischemia without necrosis (ischemia group; n = 11), and no ischemia (n = 8). One patient recovered only with conservative management was also included in no ischemia group. Two blinded radiologists retrospectively reviewed CECT including multiplanar reconstruction images, and evaluated 12 CT findings previously reported to be associated with bowel ischemia: (1) wall thickening, (2) target sign, (3) high attenuation of the wall at precontrast CT, (4) wall enhancement, (5) mesenteric edema, (6) whirl sign, (7) enhancement of mesenteric artery and (8) vein, (9) engorgement of the mesenteric veins, (10) small bowel feces, (11) ascites, and (12) intraperitoneal air. Sensitivity and specificity of each finding were compared among the three groups, and logistic regression analysis was performed.

RESULTS

Intraperitoneal air, high attenuation of the wall, reduced enhancement of mesenteric arteries and small bowel feces sign showed high specificities of 100%, 100%, 89% and 89%, however low sensitivity of 25%, 31%, 44%, 31%, respectively, to predict bowel necrosis in CL-SBO. On multivariate logistic regression analysis, reduced wall enhancement, reduced enhancement of mesenteric veins and lack of the engorgement of the mesenteric veins were significant for predicting bowel necrosis or ischemia (p < 0.05). Reduced enhancement of wall and mesenteric vessels were reliable findings to detect ischemia. On the contrary, engorgement of the mesenteric veins was predictor of viable bowel.

CLINICAL RELEVANCE/APPLICATION

Morbidity from bowel ischemia is high and increases with delay in diagnosis. Dual-energy CT may offer earlier and more confident diagnosis of bowel ischemia especially in the absence of late secondary signs. It may increase the sensitivity and specificity of CT for bowel ischemia.

METHOD AND MATERIALS

Contrast-enhanced CT (CECT) findings predicting bowel necrosis and ischemia in CL-SBO.

RESULTS

Intraperitoneal air, high attenuation of the wall, reduced enhancement of mesenteric arteries and small bowel feces sign showed high specificities of 100%, 100%, 89% and 89%, however low sensitivity of 25%, 31%, 44%, 31%, respectively, to predict bowel necrosis in CL-SBO. On multivariate logistic regression analysis, reduced wall enhancement, reduced enhancement of mesenteric veins and lack of the engorgement of the mesenteric veins were significant for predicting bowel necrosis or ischemia (p < 0.05). Reduced enhancement of wall and mesenteric vessels were reliable findings to detect ischemia. On the contrary, engorgement of the mesenteric veins was predictor of viable bowel.

CLINICAL RELEVANCE/APPLICATION

Morbidity from bowel ischemia is high and increases with delay in diagnosis. Dual-energy CT may offer earlier and more confident diagnosis of bowel ischemia especially in the absence of late secondary signs. It may increase the sensitivity and specificity of CT for bowel ischemia.

METHOD AND MATERIALS

Ischemic bowel segments (n=7) were created in swine (n=4) by surgically occluding distal mesenteric vasculature. Ischemia was confirmed grossly and with Doppler ultrasound. DECT and conventional CT were performed in arterial, portal venous, and delayed phases on a single-source fast-switching dual-energy CT scanner. ROIs of bowel wall attenuation were used to compare contrast-to-noise ratios (CNR) between ischemic and perfused segments on iodine material density and 51keV images at 80/80V (approximately 120kVp). ANOVA and post-hoc t-tests compared pixel intensities and CNR among segments and imaging groups.

RESULTS

Iodic bowel exhibited significantly lower attenuation than perfused segments on DECT-iodine material density and 51keV images (P < 0.05). DECT significantly improves the visibility of early bowel ischemia compared to conventional CT images. DECT may offer earlier and more confident diagnosis of bowel ischemia especially in the absence of late secondary signs. It may increase the sensitivity and specificity of CT for bowel ischemia.

CLINICAL RELEVANCE/APPLICATION

Morbidity from bowel ischemia is high and increases with delay in diagnosis. Dual-energy CT may offer earlier and more confident diagnosis of bowel ischemia.

METHOD AND MATERIALS

CT scans (n=57) from isolated and multivisceral small bowel transplant patients (ages 1-62, mean 26) were retrospectively reviewed with consensus reading by two radiologists blinded to pathology results. Patients had endoscopic biopsy within 3 days of CT scanning. Small bowel was assessed for wall thickening, attenuation and enhancement pattern, feces sign, pneumatosis, dilatation, mesenteric edema and adenopathy, ascites, anasarca, vascular patency, and whether the scan was done with oral or IV contrast. Demographic data obtained: age, gender, race, and transplant type. Kappa power analysis determined a goal of 20 patients per group would show at least a 60% correlation exists between groups. For the continuous variable, the differences in the averages were tested and the non-parametric Kruskal Wallis test was used since normality assumptions were not satisfied. Chi-square and Fisher’s exact tests were used to investigate the differences for categorical variables. A p-value of 0.05 was considered significant.

RESULTS

DECT significantly improves the visibility of early bowel ischemia compared to conventional CT images. DECT may offer earlier and more confident diagnosis of bowel ischemia especially in the absence of late secondary signs. It may increase the sensitivity and specificity of CT for bowel ischemia.
RESULTS
No statistical differences in age (0.69 pediatric, 0.2 adult), race (0.6), or transplant type (0.56). Significant difference between the normal and ischemia subgroup was observed in gender (0.04). No difference was observed in wall thickening (0.29), attenuation (0.66), bowel enhancement pattern (0.66), feces sign (0.1), pneumatosis (0.67), dilatation (0.11), mesenteric edema (0.8), mesenteric adenopathy (0.5), anasarca (0.89), vascular patency (0.5), those with oral contrast enhanced scans (0.23), or those with IV contrast enhanced scans (0.59). A general difference between the 5 categories was noted in the category of ascites (0.03), however specific analysis of normal vs. the four abnormal subgroups demonstrated no significant difference (ischemia 0.28, rejection 0.052, infection 0.55, PTLD 0.39).

CONCLUSION
There is no correlation between small bowel wall thickening in patients with small bowel transplant and the common complications including ischemia, rejection, PTLD, and infection.

CLINICAL RELEVANCE/APPLICATION
Small bowel wall thickening on MDCT in small bowel transplants is likely non-contributory in determining an underlying pathologic condition.

SST05-04 • Cine MR Enterography Grading of Small Bowel Peristalsis: Evaluation of the Antiperistaltic Effectiveness of Sublingual Hyoscyamine Sulfate

Peter M Ghobrial MD ; Flavius F Guglielmo MD (Presenter) ; Donald G Mitchell MD * ; Ilana Neuberger MD ; Laurence Parker PhD ; Christopher G Roth MD * ; Sandeep P Deshmukh MD ; Patrick L O’Kane MD * ; Allison Borowski MD

PURPOSE
To use a cine MR enterography (cine-MRE) pulse sequence to assess the effectiveness of a sublingual (SL) antiperistaltic agent, hyoscyamine sulfate.

METHOD AND MATERIALS
IRB approval was granted with an exemption for informed consent in this HIPAA compliant retrospective single-institution study. Of the 288 MR enterography exams performed between October 1, 2007 and January 15, 2011, 92 using SL hyoscyamine sulfate for antiperistalsis were included for review, each with cine MRE pre and post medication. These 184 cine MRE sequences were randomized, blinded for treatment, and independently reviewed by five attending abdominal radiologists, who rated the degree of bowel motility of each cine-MRE sequence on a five point scale. Pre- and post-medication mean peristalsis ratings, standard deviation, mean difference, and treatment effect sizes were calculated. A repeated measures analysis of variance (ANOVA) test was performed, using a significance threshold of p=0.05.

RESULTS
Mean peristalsis ratings ranged from 2.63 to 3.34 before, to 2.36 to 3.03 after medication administration. The mean differences ranged from 0.22 to 0.46, which are treatment effect sizes of 0.10 to 0.18. The decrease in peristalsis observed by the five reviewing radiologists after SL hyoscyamine sulfate administration was significant (df 1/182, f=7.35, p

CONCLUSION
While cine MRE sequences show decreased bowel peristalsis after use of SL hyoscyamine sulfate, the small size of the observed treatment effect is likely insufficient to justify its use for MR enterography.

CLINICAL RELEVANCE/APPLICATION
While it is possible to detect and quantify decreased bowel peristalsis caused by a sublingual anti-spasmodic agent during cine MRE, the decrease is likely too small to be of clinical significance.

SST05-05 • Ischemic Colitis: Is There a Relationship between the CT Findings, the Different Etiologies and the Timing of the Disease? A Clinical Study

Francesca Iacobellis MD (Presenter) ; Daniela Berritto MD ; Maria Paola Belfiore ; Giuliano Gagliardi ; Mariano Scaglione MD ; Maria A Mazzei MD ; Roberto Grassi MD

PURPOSE
To define the CT findings of ischemic colitis (IC), according to the different etiologies and timing of the disease.

METHOD AND MATERIALS
A computerized search of all medical records was used to retrospectively identify 130 patients who were admitted with the suspected diagnosis of IC over a five-year period. From these, 52 patients with IC proven by endoscopy with biopsies or surgical pathology were considered for the enrollment in the present study. Among 52 patients, 32 subjects (17 men and 15 women; median age 74, range 51-94 years) that underwent at least one CT examination, constituted the object of the analysis. Their medical history and CT examinations were retrospectively reviewed.

RESULTS
Among the 32 CT examinations performed in the acute phase in 62.5% no defects or occlusion of the superior mesenteric artery (SMA) or inferior mesenteric artery (IMA) was found whereas in 37.5% IMA occlusion was detected. In acute phase in 100% of patients the presence of pericolic fluid was found, undergoing progressive resorption from acute to sub-acute phase if an effective reperfusion occurred; the bowel wall thickening was observed in 28.1% patients in acute phase and in 86.4% patients evaluated in sub acute phase. The unthickened colonic wall was found in all conditions where ischemia is not followed by effective reperfusion, 71.9% of cases, and it occurred; the bowel wall thickening was observed in 28.1% patients in acute phase and in 86.4% patients evaluated in sub acute phase.

CONCLUSION
The results of this study showed that particular attention should be paid in the diagnosis of non-occlusive mesenteric ischemia (NOMI) before reperfusion representing the more difficult form of IC to detect at imaging, diagnostic difficulties may also be encountered in sub acute forms where the colon wall thickening could be misdiagnosed as normal wall with collapsed lumen, and in chronic forms where the irregular thickening of the bowel wall could be misdiagnosed if the patient's clinical history is unknown. CT has a crucial role, it allows to define the morpho-functional alterations associated with the IC distinguishing among acute, sub acute and chronic phases and allows to estimate the timing of the ischemic damage.

CLINICAL RELEVANCE/APPLICATION
The definition of the CT findings of ischemic colitis in relationship with the etiology and the timing of the disease has a crucial role to ensure a correct diagnosis and an appropriate treatment.

SST05-06 • Double Contrast-enhanced Ultrasonography Diagnosis of Rectal Lesions with Pathologic Correlation

Man Lu PhD (Presenter) ; Zhiqing Cai ; Jun Song ; Bin Song MD

PURPOSE
Recently, transabdominal ultrasonography with a gastrointestinal contrast agent has been used widely in China to detect digestive disorders. Double Contrast Enhanced Ultrasonography (DCUS) combines both a gastrointestinal luminal contrast agent with an intravenous contrast agent for imaging of lesions. The purposes of this pilot study were to assess the value of DCUS in the preoperative diagnosis of rectal lesions.

METHOD AND MATERIALS

RESULTS
Of the 227 patients examined, there were 232 rectal lesions (72 rectal adenocarcinomas, 45 adenomas and 15 inflammatory mass). The study using DCUS showed unique vascular patterns in different rectal lesions. Rectal adenocarcinoma revealed earlier AT and TP compared with normal rectal tissue (p < 0.05), earlier AT and higher PI with adenoma, earlier TP and lower PI with inflammatory mass. Rectal adenoma had lower PI compared with normal rectal tissue (p < 0.01). Rectal inflammatory mass had higher PI and earlier AT compared with normal rectal tissue.

Conclusions: DCUS is a valuable technique for differential diagnosis of benign and malignant rectal lesions in patients with pathology diagnosis. The parameters of the enhancement curves reflect the different perfusion status of the rectal lesions.

CONCLUSION
DCUS is a valuable technique for differential diagnosis of benign and malignant rectal lesions in patients with pathology diagnosis. The parameters of the enhancement curves reflect the different perfusion status of the rectal lesions.

CLINICAL RELEVANCE/APPLICATION
DCUS is a valuable technique for differential diagnosis of benign and malignant rectal lesions in patients with pathology diagnosis.

SST05-07 ● Neurorag Bowel Dysfunction in Spinal Cord Injury Patients - Diagnostic Using Functional MRI. A Feasibility Study
Celine D Alt MD (Presenter) ; Cornelia Putz ; Cornelia Hensel ; Bjoern Wagner ; Norbert Wagner ; Hans-Juergen Gerner ; Hans-Ulrich Kauczor MD * ; Lars Grenacher MD

PURPOSE
Neurogenic bowel dysfunction represents a common clinical problem in spinal cord medicine, which severely affects the quality of life following spinal cord injury (SCI). The aim of this study was to evaluate functional MRI as a diagnostic tool to visualize neurogenic bowel dysfunction in SCI patients.

METHOD AND MATERIALS
In this prospective study, 20 Th1-10 SCI patients (AIS A) given written informed consent and the study proposal was approved by the local ethics committee. Examination was performed at a 3T scanner in lateral position with angiled legs. The rectum was filled with ultrasonic gel. The protocol included T2w TR/FISP sequences in three planes at rest and in sagittal plane during defecation (30 measurements) and T2w turbo spin echo images in sagittal and axial plane. Evaluation included the hiatal width (H-line), the M-line, the anorectal angle (ARA) and the anorectal junction (ARJ). The rectal filling volume and the maximum rectum diameter were noted, until defecation procedure started.

RESULTS

CONCLUSION
MR-Defecography is feasible in SCI patients and may help to differentiate between different types of neurogenic bowel dysfunction.

CLINICAL RELEVANCE/APPLICATION
Dynamic MRI may serve as a diagnostic tool to guide therapeutic decision making in SCI patients suffering from neurogenic bowel dysfunction.

SST05-08 ● MR Imaging of Perianal Fistulas: Value of Using a Balloon Rectal Double Channel Catheter
Shuohui Yang MD (Presenter) ; Fang Lu MD ; Songhua Zhan MD ; Wenli Tan MD ; Qiong Zhu MD

PURPOSE
To investigate the value of using balloon rectal double channel catheter (BRDCC) for the diagnosis of perianal fistula patients in conventional MRI studies.

METHOD AND MATERIALS
18 perianal fistula patients with BRDCC and 18 patients without BRDCC underwent MR scans with a body coil. The number of fistulas, the internal openings, extensions and abscesses were counted. All MR findings were utilized to evaluate for the classification of the fistulas and compared with the surgery results.

RESULTS

CONCLUSION
By using BRDCC, conventional MRI can provide more information of the fistulas and their routes.

CLINICAL RELEVANCE/APPLICATION
Providing evidences of internal openings, extensions and abscesses of the anal fistula diagnosis and directing the operation of anal fistula.

SST05-09 ● Rectal MRI of Fistula-in-ano: Diagnostic Values of Diffusion-weighted Imaging (DWI)
Minho Park MD (Presenter) ; Sung Kyoung Moon ; Seong Jin Park MD, PhD ; Joo Won Lim ; Dong Ho Lee MD ; Young Tae Ko MD, PhD

PURPOSE
To investigate the diagnostic performance of DWI in fistula-in-ano.

METHOD AND MATERIALS
This study included 46 patients who underwent rectal MRI to evaluate fistula-in-ano from March 2011 to March 2012. A history of Crohn's disease (CD) and fistulectomy were reviewed. Two radiologists retrospectively reviewed rectal MRI with consensus three times at 2-week intervals. The first review assessed the presence of perianal lesions, fistula type, and lesion conspicuity with T2WI. The second review assessed fistula conspicuity with CE-FS-T1WI and T2WI. The third assessed fistula conspicuity with DWI with a b-value of 1000 and T2WI. Lipoma conspicuity was scored from 1 to 4 as follows: 1, unclear fistula tract; 2, visible fistula tract with unclear margin; 3, distinct fistula tract with partial obscuration; and 4, distinct fistula without obscuration. The lesion conspicuity was compared between CE-FS-T1WI and DWI using the Wilcoxon rank-sum test. Lesion conspicuity according to the clinical history was assessed using the Mann-Whitney U-test.

RESULTS

The lesion conspicuity of DWI with a b-value of 1000 was similar to that of CE-FS-T1WI, and significantly better in the patients with CD. The lesion conspicuity of DWI with a b-value of 1000 was significantly better in the patients with CD than those without CD (p=0.004).

CONCLUSION
The lesion conspicuity of DWI with a b-value of 1000 was similar to that of CE-FS-T1WI, and significantly better in the patients with CD.

CLINICAL RELEVANCE/APPLICATION
DWI with a high b-value could help to inform clinicians about fistula shape and type.
SST06-01 • Image Quality on Liver CT Based on Sinogram Affirmed Iterative Reconstruction Algorithm

**Boris Schulz** MD (Presenter); **Boris Bodelle** MD; **Petra Siebenhandl**; **Martin Beeres** MD; **Firas Al-Butmeh**; **Claudia Freiliesen**; **Thomas J Vogl** MD, PhD

**PURPOSE**
To evaluate efficiency of sinogram affirmed iterative reconstruction technique, regarding noise and image quality on contrast enhanced computed tomography (CT) of the liver.

**METHOD AND MATERIALS**
CT examinations were performed upon 32 patients (128 slice CT, 120kV, 180mAs, activated tube current modulation, 0.6mm collimation). Each examination was reconstructed at standard filtered back projection (FBP) and 5 different SAFIRE strengths in 5mm images in transversal direction with soft tissue kernel. Image noise was defined as standard deviation (SD) of Hounsfield units (HU) in air, and signal to noise ratio (SNR) of the liver was defined as mean liver HU per liver SD. Subjective image quality was evaluated by three raters using a 5-point scale (1=non-diagnostic image quality, 5=excellent image quality).

**RESULTS**
Average image noise was 6.2HU (FBP), vs. 5.7HU (SAFIRE 1), vs. 5.0 (SAFIRE 2) 4.4HU (SAFIRE 3), 3.8HU (SAFIRE 4), 3.1HU (SAFIRE 5). SNR of the liver consecutively increased when using the iterative reconstruction algorithms from 8.4 (FBP) to 9.3 (SAFIRE 1) to 10.4 (SAFIRE 2) to 12.2 (SAFIRE 3) to 15.1 (SAFIRE 4) to 17.5 (SAFIRE 5). The differences in image noise and SNR of each SAFIRE-strength to FBP was statistically significant (p).

**CONCLUSION**
Sinogram affirmed based iterative reconstruction technique significantly reduces image noise and increases SNR for examinations of the liver. However subjective image quality decreases with strong iterative strengths.

**CLINICAL RELEVANCE/APPLICATION**
Since subjective image quality decreased slightly with iterative reconstructive techniques, mild iterations are recommended to enhance image quality on liver CT.

SST06-02 • The Clinical Utility of Diffusion-weighted-Imaging of the Abdomen with Ultra-high b-values

**Melissa Ong** MD (Presenter); **Johannes Budjan** MD; **Stefan Haneder** MD; **Stefan O Schoenberg** MD, PhD *; **Ulrike I Attenberger** MD *; **Henrik J Michaely** MD *

**PURPOSE**
To evaluate the clinical utility of diffusion-weighted-imaging (DWI) of the abdomen with ultra-high b-values.

**METHOD AND MATERIALS**
In this retrospective IRB approved study 46 consecutive patients (30 women, 16 men, mean age 54±17.5) who underwent abdominal MR-exams including a DWI-EPI sequence with b-values of 50, 800 and 2000 s/mm² on a 3T MRI-system (Siemens Skyra) were included. Overall image quality with regard to detection of pathology and degree of artifacts as well lesion conspicuity in the b800 and b2000 images were compared by two board-certified radiologists (1: preferring b2000; 2: preferring b800; 0: no difference). Quantitative analysis included determination of signal-to-noise-ratio of sample tissues including the kidneys and the ventral and dorsal subcutaneous fat.

**RESULTS**
Reader 1 preferred the b2000 image in 30 (67%) patients, reader 2 in 32 (71%) patients. The b800 image was preferred in only 2 (4%) patients by both readers. Interobserver agreement was k=0.706 for overall image quality. Lesion conspicuity was rated better in the b2000 images in 31 (69%) patients and the b800 images in 1 (2%) patient by reader 1, in 27 (60%) and 2 patients (4%) by reader 2. Measure of agreement was k=0.494 for lesion conspicuity. There were no differences observed regarding artifacts. The signal-to-noise ratio measured 37.47 (±14.96) vs. 15.74 (±4.07) and 41.46 (±16.21) vs. 16.90 (±5.52) in the b800 and b2000-images for the left and right kidney, 9.22 (±3.18) vs. 12.05 (±3.75) and 9.80 (±2.52) vs. 12.14 (±2.93) for the ventral and dorsal fat, respectively.

**CONCLUSION**
DWI of the abdomen with ultra-high b-values of 2000 s/mm² is feasible for lesion detection with good to acceptable image quality.

**CLINICAL RELEVANCE/APPLICATION**
Ultra-high b-values should be used in a clinical routine as a feasible tool for lesion detection.

SST06-03 • Multiphasic Contrast Enhanced Free Breathing 3D Imaging and Liver Perfusion Mapping Using Through-time 3D Spiral GRAPPA Acceleration

**Yong Chen**; **Gregory R Lee**; **Katherine Wright**; **Mark A Griswold** PhD *; **Nicole Seiberlich** PhD *; **Vikas Gulani** MD, PhD (Presenter)

**PURPOSE**
The goal of this work is to demonstrate high spatiotemporal resolution quantitative DCE liver MRI using a 3D stack-of-spirals acquisition, through-time non-Cartesian GRAPPA reconstruction, non-rigid body motion correction, and application of a dual-input single compartment model for quantitative perfusion mapping.

**METHOD AND MATERIALS**
MRI experiments were performed upon a Siemens 3T Skyra scanner with normal volunteers (N = 4), and 0.1 mmol/kg Gadobenate (Multihance, Bracco, NJ) was given. T1-weighted 3D volumes were acquired using a stack-of-spirals gradient echo sequence. 120 volumes were acquired with a temporal resolution of 1.6-1.9 seconds, while the subjects were breathing freely. To accelerate the acquisition, data were undersampled in-plane with a reduction factor of 6, and reconstructed using through-time non-Cartesian GRAPPA. The reconstructed volumes were registered using FMRIB's Non-linear Image Registration Tool (FNIRT). A dual-input single-compartment model was established to retrieve liver perfusion parameters from DCE-MRI data.

**RESULTS**
Images with high spatial resolution of 1.9x1.9x3 mm³ are obtained with whole liver coverage. With the high imaging speed of less than 2 sec/volume, a free-breathing scan is achieved, and subtle dynamic changes in contrast enhancement are captured. The free-breathing 3D images were registered with almost no residual motion in sample tissue. Quantitative whole liver 3D perfusion maps were obtained and the perfusion parameters are all in good agreement with published literature from CT and MR.
CONCLUSION
In this study, a high spatiotemporal resolution 3D liver imaging technique was developed using a stack-of-spirals acquisition and through-time non-Cartesian GRAPPA acceleration. This technique allows fast imaging of the whole liver during free breathing and accurate quantification of liver perfusion.

CLINICAL RELEVANCE/APPLICATION
Free-breathing abdominal scans with through-time spiral GRAPPA can provide diagnostic images from patients with difficulty breath-holding and additional quantitative information of liver perfusion.

SST06-04 • 4D Flow MRI with k-t GRAPPA in the Quantitative Assessment of PV Hemodynamics in Patients with Advanced Liver Cirrhosis: Initial Results and Comparison to Age-matched Controls
Zoran Stankovic MD (Presenter) ; Eduard Semaan ; Michael Markl PhD ; Marie Wasielewski ; Maria Carr ; Robert J Lewandowski MD * ; Riad Salem MD, MBA * ; James C Carr MD * ; Jeremy D Collins MD *

PURPOSE
To qualitatively and quantitatively evaluate blood flow hemodynamics in the portal venous (PV) system of patients with advanced liver cirrhosis compared to age-matched controls at non-contrast 4D flow MRI with contrast-enhanced 4D flow MRI as the standard of reference.

METHOD AND MATERIALS
In an ongoing study, time-resolved 4D flow MRI was applied at 3T (venc=50cm/sec, spatial resolution=2.1x2.5x3.0mm3) with and without a blood pool contrast agent in 20 datasets representing 5 patients with advanced liver cirrhosis (age=55±6years) compared to 5 healthy age-matched controls (age=53±9years). k-t GRAPPA was used with an acceleration factor R=5 to reduce scan time. 3D PV visualization was based on 3D streamlines and time-resolved particle traces. Flow quantification was performed in the PV system with retrospective extraction of time-resolved peak velocities and net flow over the cardiac cycle. Bland Altman (BA) analyses compared the datasets before and after contrast application (mean bias±2SD).

RESULTS
Qualitative image analysis was successfully performed in the PV system with clear resolution of all branches except the superior mesenteric vein in one patient. Quantitative analyses demonstrated similar results before and after contrast for peak velocities (BA:0.012±0.029), while net flow values demonstrated a -7% bias for the non-contrast analysis (BA:-0.141±0.412). Comparing patients with liver cirrhosis and age-matched controls significant differences for peak velocities were seen only in the intrahepatic portal vein before and in the right intrahepatic portal vein branch after contrast application (p

CONCLUSION
4D flow MRI enabled quantitation of comprehensive 3D flow characteristics in the portal venous system in patients with liver cirrhosis and visualized abnormal blood flow hemodynamics. Non-contrast 4D flow MRI analyses demonstrated similar peak velocity assessment compared to a contrast-enhanced acquisition, although net flow was underestimated by 7%; field inhomogeneities may have accounted for the bias in net flow.

CLINICAL RELEVANCE/APPLICATION
4D flow MRI may improve quantification of altered liver blood flow hemodynamics in patients with advanced liver cirrhosis enabling quantitative analysis without Gadolinium based contrast media.

SST06-05 • Quantification of Hepatic Blood Flow, ADC and Stiffness in Fasting and Post-prandial Conditions: Prospective Study at 3T
Guido H Jajamovich PhD (Presenter) ; Hadrien Dyvorne PhD ; Ersin Bayram PhD * ; Claudia Donnerhack ; Richard L Ehman MD * ; Bachir Tsouli MD *

PURPOSE
Techniques such as MR Elastography (MRE), phase contrast (PC) and diffusion-weighted imaging (DWI) have potential for non-invasive detection of liver fibrosis, cirrhosis and portal hypertension. Since portal flow and liver stiffness (LS) may be altered by food intake, changes in LS, portal vein (PV) flow, PV velocity and liver ADC might be observed and may lead to decreased reproducibility. This prospective study quantifies reproducibility (in fasting conditions) and post-prandial changes in PV flow/velocity, LS, and liver ADC at 3T.

METHOD AND MATERIALS
11 healthy volunteers and 7 patients with HCV cirrhosis were enrolled in this prospective IRB approved study. All subjects underwent 3T MRI (MR750, GE Healthcare), including 2D PC (pulse triggered, VENC=50 cm/s, slice perpendicular to portal vein), axial SS EPI DWI (free breathing, 16 b-values from 0 to 800 mm2/s) and MRE (4 slices through the liver). All subjects were initially scanned twice after 6 hours of fasting to assess reproducibility of each technique, and then scanned again 20 minutes after a 700 Kcal liquid meal. To quantify PV flow and velocity, a ROI was drawn in the PV on PC images. Mean LS and liver ADC were obtained by placing a ROI in the right hepatic lobe on LS maps and diffusion images. The coefficients of variation (CV) were computed for the two scans in fasting state. Wilcoxon paired tests and Mann-Whitney U tests were performed to assess differences in these metrics before and after caloric intake (average from the 2 fasting scans was used for comparison) and differences between patients and volunteers, respectively.

RESULTS
PV flow, PV velocity, liver ADC and LS showed good to excellent reproducibility in fasting state, with CVs ranging from 3.6%-11.8%. PV flow, PV velocity and LS were all significantly higher in postprandial state (p

CONCLUSION
These results indicate that caloric intake is a factor to consider in interpreting PC-based PV flow/velocity and MRE-based hepatic stiffness measurements. LS can be used to separate cirrhotic patients from healthy volunteers.

CLINICAL RELEVANCE/APPLICATION
Liver blood flow and metabolism (portal venous flow/velocity and liver stiffness) are altered significantly in the postprandial state, showing the importance of undergoing MRI in a controlled state.

SST06-06 • Start of Hepatocyte Uptake in Gadoxetate Disodium (Gd-EOB-DTPA) Enhanced MRI in Normal Liver Parenchyma
Hanke Schalkx MD (Presenter) ; Marijn Van Stralen PhD ; Kenneth Coenegrachts MD ; M.A.J. van den Bosch ; Wouter B Veldhuis MD, PhD ; Maarten S Van Leeuwen MD, PhD

PURPOSE
To evaluate the enhancement pattern of normal liver parenchyma in contrast-enhanced (CE) magnetic resonance imaging (MRI) using gadoxetate disodium, with special emphasis on the start of the hepatocyte uptake.

METHOD AND MATERIALS
23 patients with chronic liver disease underwent CE-MRI with gadoxetate disodium (Gd-EOB-DTPA, Primovist or Eovist, Bayer, Netherlands) on a 1.5T MRI system (Philips, Best, The Netherlands) using a 4D-THRIVE key hole protocol [1] resulting in a total of 17 3D-acquisitions up to 20 minutes.

After contrast administration of 0.25 mmol/kg gadoxetate disodium at 1 ml/s the first dynamic scan (t=0) was triggered on left ventricle filling. Signal intensity of liver parenchyma was measured on all scans, averaged over 3 regions-of-interest. Parenchymal enhancement was calculated as the relative signal intensity (SI1) increase with respect to pre-contrast parenchymal intensity.

RESULTS
The initial, portal phase induced, parenchyma peak with a relative SI of 0.53 (SD=0.18) occurred at mean 37.6 s ± SD 14.3 s. After the initial peak, 12/21 patients (57%) showed gradual increase in enhancement until 20 min. In 2/21 patients (2%) enhancement remained
CONCLUSION
After the initial, dynamic phase induced, parenchyma peak, three different enhancement patterns were observed. Increase in parenchymal enhancement due to gadoxetate disodium uptake started at mean 37.6 sec, and no later than 76 sec. [1] Beck, G.M., et al., J Magn Reson Imaging, 2008. 27(6): p. 1461-7.

CLINICAL RELEVANCE/APPLICATION
In CE-MRI after gadoxetate disodium, hepatocyte uptake already influences parenchymal enhancement in the early dynamic phases, potentially influencing lesion detection and characterization.

SST06-07 • Gadobenate Dimeglumine Enhanced Liver MRI: Quantitative Analysis of Hepatobiliary Phase According to Incremental Flip Angle

Eunjung Lee (Presenter) ; Dae Jung Kim MD

PURPOSE
To evaluate effects on hepatic parenchymal phase with using gadobenate dimeglumine (BOPTA) enhanced 3D T1-weighted (T1) gradient echo sequence (GRE) magnetic resonance imaging (MRI) during increasing the flip angle.

METHOD AND MATERIALS
A total of 43 patients, who had a BOPTA enhanced MR exam for evaluation of focal lesion in the liver, were enrolled during three months. Hepatobiliary phase fat suppressed 3D T1 GRE sequences with 10°, 20°, 30° flip angles (FAs) were obtained at 90 min. Signal intensity (SI) of the liver in precontrast phase and hepatobiliary phase with each FAs was measured using region-of-interest (ROI), as large as possible, 2 times measurement at each hemiliver. Noise estimates were derived by recording three times the standard deviation of the noise measured anterior to the liver, outside of the body. SI of each hepatic lesions (long axis = 10 mm) in hepatobiliary phase with each FAs was also measured using ROI, as large as possible. The relative enhancement (RE) of liver parenchyma at hepatobiliary phase with each FAs was calculated, as following: RE = (SI-post - SI-pre)/SI-pre. The signal to noise ratio (SNR) of liver parenchyma at hepatobiliary phase with each FAs was calculated, as following: SNR = SI-liver / SI-noise. The lesion-to-liver contrast to noise ratio (CNR) at hepatobiliary phase with each FAs was calculated, as following: CNR = (SI-lesion - SI-liver) / SI-noise. Analysis of variance with the Sheffe method was used to evaluate statistical significance of the differences in RE, SNR and CNR values, according to the each FAs.

RESULTS
The RE values of hepatic parenchyma was significantly different in each FAs (10°, RE=0.73; 20°, RE=0.65; 30°, RE=0.52; p=0.002). The SNR of hepatic parenchyma values was not significantly different in each FAs (10°, SNR=26.3; 20°, SNR=25; 30°, SNR=23.3; p=0.093). Twenty five patients out of all patients had 41 lesions, which were consisted with 5 benign lesions and 36 malignant lesions. The CNR of lesions was not significantly different in each FAs (10°, CNR=5.9; 20°, CNR=7.9; 30°, CNR=8.1; p=0.223).

CONCLUSION
Increasing the FA on hepatobiliary phase of BOPTA enhanced MRI affects only relative hepatic parenchyma enhancement.

CLINICAL RELEVANCE/APPLICATION
Hepatobiliary phase with high degree of flip angle on BOPTA enhanced MRI decreased only hepatic parenchyma enhancement and didn’t affect contrast noise ratio of the lesion.

SST06-08 • Respiratory Motion Artifact Affecting Arterial-phase Imaging—Comparison of Gadoxetate Disodium and Gadobenate Dimeglumine and Exam Recovery Using Multi-arterial Phase Acquisitions

Jason A Pietryga MD (Presenter) ; Lauren M Burke MD ; Tracy A Jaffe MD ; Mustafa R Bashir MD *

PURPOSE
To compare the rates of moderate/severe respiratory motion artifact on arterial-phase magnetic resonance imaging (MRI) when using gadoxetate disodium versus gadobenate dimeglumine intravenous contrast, and to assess if obtaining multiple arterial phases salvages some studies with motion.

METHOD AND MATERIALS
This is an IRB-approved HIPAA-compliant study. A retrospective search identified consecutive outpatients who had undergone contrast-enhanced MR imaging of the abdomen using either gadoxetate disodium or gadobenate dimeglumine over a period of three months using identical imaging protocols. Three board-certified radiologists (blinded to the contrast agent used) independently reviewed the following T1-weighted series for motion artifact: precontrast, three rapid arterial phases obtained in a single breath hold, portal venous phase, and late dynamic phase. Series were scored for severity of respiratory motion on a scale of 1(none) to 5(nondiagnostic), the following T1-weighted series for motion artifact: precontrast, three rapid arterial phases obtained in a single breath hold, portal venous phase, and late dynamic phase. Series were scored for severity of respiratory motion on a scale of 1(none) to 5(nondiagnostic), and exams where at least one well-timed late arterial phase had less than severe (2) motion scores were compared between exams obtained with the two contrast agents for: number of exams with new (not present on precontrast phase) moderate (3) or severe (4) motion on at least one arterial phase, and exams where at least one well-timed late arterial phase had less than severe (2) motion.

RESULTS
275 qualifying examinations were identified (166-gadoxetate/109-gadobenate). Exams performed with gadoxetate had higher rates of new moderate (42.8% vs. 16.8%, p=0.093).

CONCLUSION
Transient moderate and severe motion artifact in the hepatic arterial phase occurs at a higher rate with gadoxetate disodium than with gadobenate dimeglumine. A multi-arterial phase acquisition scheme can recover a proportion of those examinations partially affected by arterial phase motion.

CLINICAL RELEVANCE/APPLICATION
Increased rates of significant motion artifact are seen when imaging the liver in the arterial phase with gadobenate contrast vs. dimethylamine. Multi-arterial phase acquisition may salvage some exams.

SST06-09 • Liver MRI with Gadofosveset Trisodium

Laurent Milot MD, MSc (Presenter) ; Shoichet Martin MD ; Helen Cheung MD ; Caitlin T McGregor MD ; Megan Snoyer MD ; Masoom A Haider MD * ; Liang Zeng MD ; Chirag Patel MBBS, MRCP ; George Tomlinson MD ; Calvin Law MD *, Megan Snoyer MD

PURPOSE
To illustrate the benefits and limitations of liver imaging performed with an intravascular blood pool agent Gadofosveset Trisodium (Gadofos) compared with an extracellular Gadolinium (EcGd) agent Gadobutrol.

METHOD AND MATERIALS
RESULTS
CONCLUSION
Enhancement pattern of background vessels/liver parenchyma and benign lesions is similar for both agents but Ablavar does not accumulate in metastatic lesions over time, a key differentiating feature. Pitfall may exist in some cases of NET.

CLINICAL RELEVANCE/APPLICATION
Liver imaging with Ablavar may help in the characterization of small equivocal liver lesions, especially in the context of patients with known
### Disclosure Index

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Zalis, M. E. - Co-founder, QPID Inc Stockholder, QPID Inc
Zamboni, G. - Speaker, Guerbet SA