

2013 RSNA (Filtered Schedule)

Sunday, December 01, 2013

10:45-12:15 PM • **SSA05** • Room: N228 • Emergency Radiology (Imaging Chest Emergencies)
12:30-01:00 PM • **LL-ERS-SUA** • Room: Lakeside Learning Center • Emergency Radiology - Sunday Posters and Exhibits (12:30pm - 1:00pm)
01:00-01:30 PM • **LL-ERS-SUB** • Room: Lakeside Learning Center • Emergency Radiology - Sunday Posters and Exhibits (1:00pm - 1:30pm)
02:00-03:30 PM • **RC105** • Room: S406B • Traumatic Brain Injury
02:00-03:30 PM • **RC108** • Room: E353B • Imaging of the Traumatized Spine (Traditional) (An Interactive Session)

Monday, December 02, 2013

07:15-08:15 AM • **SPSH20** • Room: E451B • Hot Topic Session: Concussion and Traumatic Brain Injury
08:30-10:00 AM • **RC250** • Room: S403A • Interventional Stroke Treatment: Practical Techniques and Protocols (How-to Workshop)
08:30-12:00 PM • **VSER21** • Room: E350 • Emergency Radiology Series: Advanced Concepts in Imaging of Trauma
10:30-12:00 PM • **SSC12** • Room: N229 • Neuroradiology/Head and Neck (Traumatic Brain Injury)
12:15-12:45 PM • **LL-ERS-MOA** • Room: Lakeside Learning Center • Emergency Radiology - Monday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • **LL-ERS-MOB** • Room: Lakeside Learning Center • Emergency Radiology - Monday Posters and Exhibits (12:45pm - 1:15pm)
03:00-04:00 PM • **SSE06** • Room: N227 • Emergency Radiology (ER Practice and Utilization)
03:00-04:00 PM • **SSE21** • Room: S102AB • Pediatric (Neuroimaging)

Tuesday, December 03, 2013

08:30-12:00 PM • **VSER31** • Room: E352 • Emergency Radiology Series: Leveraging Technology for State-of-the-Art Practice
12:15-12:45 PM • **LL-ERS-TUA** • Room: Lakeside Learning Center • Emergency Radiology - Tuesday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • **LL-ERS-TUB** • Room: Lakeside Learning Center • Emergency Radiology - Tuesday Posters and Exhibits (12:45pm - 1:15pm)
03:00-04:00 PM • **SSJ07** • Room: N227 • Emergency Radiology (Brain Emergencies)
03:30-05:00 PM • **MSES34** • Room: S100AB • Essentials of Trauma Imaging
04:30-06:00 PM • **RC408** • Room: E450B • Stroke Imaging for the Emergency Radiologist (An Interactive Session)

Wednesday, December 04, 2013

08:30-10:00 AM • **MSSR41** • Room: S402AB • RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)
08:30-10:00 AM • **RC504** • Room: N227 • Bone and Cartilage Injury: Traumatic and Stress-related Chondral, Osteochondral and Subchondral Failure with E...
08:30-10:00 AM • **RC513** • Room: S103AB • Child Abuse (An Interactive Session)
10:30-12:00 PM • **MSSR42** • Room: S402AB • RSNA/ESR Emergency Symposium: CNS Emergencies (An Interactive Session)
12:15-12:45 PM • **LL-ERS-WEA** • Room: Lakeside Learning Center • Emergency Radiology - Wednesday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • **LL-ERS-WEB** • Room: Lakeside Learning Center • Emergency Radiology - Wednesday Posters and Exhibits (12:45pm - 1:15pm)
01:30-03:00 PM • **MSSR43** • Room: S402AB • RSNA/ESR Emergency Symposium: Chest Emergencies (An Interactive Session)
03:30-05:00 PM • **MSSR44** • Room: S402AB • RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)
04:30-06:00 PM • **SPSC45** • Room: S404CD • Controversy Session: The Heart of the Matter: Nuclear Stress Test vs CTA for Low to Intermediate Risk Cardiac ...

Thursday, December 05, 2013

08:30-10:00 AM • **RC608** • Room: E450A • The Acute Abdomen and Pelvis (An Interactive Session)
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)
10:40-11:40 AM • **MSRT53** • Room: N230 • ASRT@RSNA 2013: Elbow and Forearm Trauma: Mechanisms of Injury and Patterns of Fractures
12:15-12:45 PM • **LL-ERS-THA** • Room: Lakeside Learning Center • Emergency Radiology - Thursday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • **LL-ERS-THB** • Room: Lakeside Learning Center • Emergency Radiology - Thursday Posters and Exhibits (12:45pm - 1:15pm)
04:30-06:00 PM • **RC705** • Room: E451A • Non-Traumatic Neuro Emergencies
04:30-06:00 PM • **RC708** • Room: E350 • Emergency Musculoskeletal Radiology: The Usual (and Unusual) Suspects

Friday, December 06, 2013

08:30-10:00 AM • **RC805** • Room: N227 • Brain Aneurysms
08:30-10:00 AM • **RC808** • Room: E353C • Emergency Radiology Case-based Countdown (An Interactive Session)

Emergency Radiology Case of the Day

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LL-EDE3004

Moderator

Guillermo P Sangster, MD
Maureen G Heldmann, MD
Alberto A Simoncini, MD
Carlos H Previgliano, MD
Justin W Skweres, MD
Kevin C Cormier, MD

PURPOSE/AIM

1) Participants will test their diagnostic skills on the imaging findings of challenging cases in Emergency Radiology. 2) Key radiologic signs will be shown and discussed to generate a list of differential diagnoses.

Emergency Radiology Case of the Day

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Multimodality Imaging Evaluation of Ovarian Torsion

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LL-ERE1181

Amit Marwah , MD
Parinda Shah , MD
Rohan Shah , MD
Mai Britt Campbell , MD

PURPOSE/AIM

Ovarian torsion is a frequently encountered entity in the emergency setting, accounting for approximately 3% of all gynecological emergencies. It is important for the general radiologist to make such a diagnosis in an accurate and timely fashion. Currently, ultrasound is recommended as the first-line diagnostic examination when ovarian torsion is a consideration. At times, other imaging modalities are ordered from the emergency department prior to ultrasound, especially when the presenting clinical symptoms may be atypical. Thus, it is important for the radiologist to be aware of the appearance of ovarian torsion using a variety of imaging modalities other than ultrasound. We provide a review of the common findings of ovarian torsion using the modalities of computed tomography, MRI and ultrasound imaging.

CONTENT ORGANIZATION

Review of the female pelvic anatomy
Pathophysiology of ovarian torsion
Common imaging findings of ovarian torsion using US, CT, and MRI
Pitfalls and mimics of ovarian torsion

SUMMARY

An accurate, timely diagnosis of ovarian torsion is of utmost importance for the radiologist. As ultrasound may not always be the first-line examination ordered by the emergency physician, it is important for the general radiologist to be familiar with the appearance of ovarian torsion using a variety of imaging modalities, including MRI and CT.

The Black and White Truth about Domestic Violence

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LL-ERE1182

Sonya Bhole , MD
Carla B Harmath , MD
Aaron Bhole

PURPOSE/AIM

Raise awareness of domestic violence in adults by displaying a gamut of associated radiological findings. Review the crucial role radiologists play in screening and preventing acts of domestic violence.

CONTENT ORGANIZATION

The radiological findings of child abuse have been a focus of radiological education. Intimate partner violence (IPV) is a significant health burden, however this is not frequently illustrated in the radiology literature. IPV is estimated to cause 50% of acute injuries in women, contributing to 21% of injuries that require emergent surgery. Health care providers play a crucial role in screening, treating and preventing future acts of domestic violence. Radiologists in particular are in a unique position in cases of domestic violence, unbiased by interaction with the victim and potentially the abuser. The purpose of this educational exhibit is to educate and raise awareness of domestic violence and the radiologic findings of the common injuries associated with intimate partner violence. Head and neck injuries are the most common; however, any part of the body is at risk for injury in cases of domestic violence.

SUMMARY

While child abuse has received attention in the radiology field, domestic adult abuse has been neglected. Familiarity with common radiographic findings can help maintain a high index of suspicion for abuse and expedite patient care.

Cancer Diagnosis in the Emergency Department: The Role of the Radiologist

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LL-ERE1183

Akash D Shah , MD
Daniel S Chow , MD
Morris Hayim , MD
Michael Nguyen , MPH
Saravanan K Krishnamoorthy , MD

PURPOSE/AIM

Up to 25% of newly diagnosed malignancies are discovered in emergency departments. Patients often present with nonspecific symptoms necessitating an imaging workup, including weight loss, headache, pain, nausea and vomiting, fever, and cough. The most common malignancies diagnosed in the emergency setting are brain, lung, and gastrointestinal neoplasms. As imaging plays a central role in the discovery of these malignant tumors, radiologists should be familiar with common clinical scenarios and imaging presentations of tumors in the emergency setting, and how to further route patients through the healthcare system.

CONTENT ORGANIZATION

1) Discussion of common clinical presentations leading to diagnosis of new malignancy by imaging 2) Review of imaging findings 3) Discussion of appropriate clinical, imaging, and/or interventional followup recommendations 4) Discussion of options for inpatient cancer imaging, with emphasis on resources needed for PET or MRI versus CT

SUMMARY

New malignancies are commonly diagnosed in the emergency setting. With radiologists playing a vital role in the diagnosis, familiarity with imaging features and appropriate follow-up is essential in optimizing patient care.

Complication of Splenic Artery Embolization for Blunt Splenic Trauma

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LL-ERE1184

Mohan L Parihar , MD
Ekta Dhamija , MD
Atin Kumar , MD
Shivanand R Gamanagatti , MBBS, MD
Ashu Seth Bhalla , MBBS, MD
Manisha Jana , MD, FRCR

PURPOSE/AIM

- Illustrate the angiographic and/or computed tomography imaging appearance of procedural, minor as well as major complications of SAE.
- Emphasize the role of early and delayed follow up of patients undergoing SAE

CONTENT ORGANIZATION

This exhibit will illustrate the imaging findings of:

1. Procedural complications of SAE-
 - a. Inadvertent embolization of dorsal pancreatic artery
 - b. Intravascular fracture of angiographic catheter
 2. Minor and early complications: Pain, fever, pleural effusion, insignificant splenic infarction (a. Significant splenic infarction (>25% of splenic volume)
 - b. Splenic abscess
 - c. Acute pancreatitis
- The exhibit will also demonstrate normal post embolization appearance of spleen on Computed Tomography

SUMMARY

The radiologist plays a major role in nonoperative management of traumatic splenic injury. **Recognition of the clinical and radiologic features of the various complications is imperative to achieve prompt and accurate treatment which may significantly reduce morbidity and mortality. Knowledge about normal post SAE findings is also important to avoid unwarranted intervention.**

Bowel Ischemia: Differentiating Arterial Thromboembolism from Mesenteric Venous Thrombosis with MDCT. What the Emergency Radiologist Needs to Know.

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LL-ERE1185

Joseph G Livingston , MD
Matthew T Heller , MD

PURPOSE/AIM

The purpose of this exhibit is: 1) To review, compare and contrast the pathophysiology and clinical presentation of mesenteric arterial thromboembolism and mesenteric venous thrombosis. 2) To illustrate and discuss cross-sectional imaging findings associated with these disease processes. 3) To discuss the role of cross-sectional imaging in the management and follow-up of these patients.

CONTENT ORGANIZATION

1. Clinical presentation.
2. Pathophysiology.
3. Imaging findings on MDCT.
4. Medical/surgical management and follow-up imaging.

SUMMARY

Bowel ischemia can result in significant morbidity and mortality. Clinical diagnosis remains challenging due to nonspecific signs and symptoms. Since bowel ischemia can be due to mesenteric arterial thromboembolism or venous thrombosis, accurate diagnosis is critical. Therefore, MDCT plays an essential role in diagnosis of these disease processes due to their distinct treatment algorithms. This exhibit will highlight key MDCT findings of bowel ischemia caused by arterial thromboembolism and venous thrombosis and discuss various treatment options with which the emergency radiologist should be aware.

Scintigraphy in the Emergency Setting: From A to V/Q

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LL-ERE1187

Daniel I Glazer , MD
Suzanne T Chong , MD
Carrie N Hoff , MD
Richard K. J. Brown , MD *
Paul N Chen , MD
Anthony Khuu , MD

PURPOSE/AIM

Nuclear medicine imaging provides important physiologic information that cannot be obtained with other imaging modalities and can effectively triage acutely ill patients in the emergency department when utilized appropriately. The purpose of this exhibit is to review the nuclear medicine studies that are used in the emergent setting.

CONTENT ORGANIZATION

Bone, HIDA, tagged RBC, labeled WBC and V/Q scans and their respective utility in the evaluation of osteomyelitis, stress fractures, cholecystitis, gastrointestinal bleeding, vascular graft infections and pulmonary embolic disease will be discussed. Normal and variant biodistribution of radiotracer uptake, imaging pearls and pitfalls, mimics of disease and imaging artifacts will be reviewed. Correlative multimodality imaging and radiation dose issues will be presented. Embedded QR codes will be utilized to show cine images.

SUMMARY

Nuclear scintigraphy in the emergency setting can provide invaluable diagnostic information. After reviewing this exhibit, the radiologist will have a comprehensive understanding of these essential techniques, how to interpret them and when to recommend them for the appropriate management of acutely ill patients.

Easily Missed Traumatic Injuries on Chest Radiographs Hiding in Plain Sight: A Pictorial Review

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LL-ERE1188

Rahul Nayyar , MD
Krishna K Das , MD
Rolf A Grage , MD *

PURPOSE/AIM

This exhibit will demonstrate examples of easily missed, sometimes life-threatening, injuries on chest radiograph at initial presentation. Our project will include plain film and CT correlate findings of traumatic thoracic injuries which are difficult to evaluate on supine chest radiograph, but easily seen on CT. Examples of injuries that we will illustrate include: pneumomediastinum, parenchymal injuries, pneumothoraces, thoracic skeletal injuries, and aortic pathology. The aim of our exhibit is to help residents understand and appreciate the unique complexities and injury patterns on chest radiograph, which can be commonly overlooked on call.

CONTENT ORGANIZATION

- 1) Intro to blunt chest trauma and role of plain film and CT in trauma work up. 2) Radiographic anatomy of the thorax. 3) Radiographic examples with corresponding CT images of: Pneumomediastinum, Parenchymal injuries, Pneumothoraces, Thoracic skeletal injuries, and Aortic injuries. 4) Take home messages/conclusion.

SUMMARY

Our presentation will serve to educate radiology residents on easily overlooked/missed potentially life threatening findings on chest radiograph. In our review, we found that the CT correlate served as a humbling reminder of the complexities and subtleties of the chest radiograph that in retrospect appear to be hiding in plain sight.

Fatal Gunshots Injuries on Postmortem Computed Tomography

LL-ERE1189

Garyfalia Ampanozi , MD
Steffen Ross , MD
Thomas D Ruder , MD
Michael J Thali , MD
Patricia M Flach , MD

PURPOSE/AIM

The purpose of this education exhibit is to review imaging characteristics on postmortem computed tomography (PMCT) in the forensic examination of gunshot wounds. The forensic importance, radiological advantages and the limitations of performing PMCT in fatal gunshot cases will be discussed.

CONTENT ORGANIZATION

- A. Review of imaging and forensic characteristics of head and torso gunshot fatalities.
- B. Entry and exit wound characteristics.
- C. Projectile path identification.
- D. Detection of gunshot residues.
- E. Projectile localization.
- F. Pictorial demonstration of gunshot fatalities.
- G. Discussion of advantages and potential limitations regarding PMCT examinations in gunshot fatalities.

SUMMARY

PMCT substantially adds value to a forensic examination of gunshot wounds, whilst enabling detection of the entry and exit wound, potential sequence of shots, firing distance, projectile trajectory and precise localization of projectiles. Imaging contributes significantly to the criminalistics case work-up and facilitates answering forensic relevant questions. Radiological data, especially 3 D-reconstructions, is easy understandable for lay-people and demonstration in court. Moreover, the images can be stored permanently for objective counter-expertise contrariwise to the destructive procedure of autopsy. and primarily to the documentation of the findings.

Challenges in MR Imaging for Suspected Acute Appendicitis in Pregnant Patients

LL-ERE1190

Ajay K Singh , MD
Noah G Ditkofsky , MD
Mukesh G Harisinghani , MD
Robert A Novelline , MD
Sanjay Saini , MD

PURPOSE/AIM

The aim of this exhibit is to review the technical challenges associated with MR imaging of pregnant patients where acute appendicitis is suspected.

CONTENT ORGANIZATION

When to use MR for appendicitis: Appropriateness criterias for right lower quadrnt pain MR safety in pregnancy: ACR Blue ribbon panel (2007) and ISMRM safety committee recommendations. Acutely ill patient: What sequences to obtain first? Sedation and pain management: Improving image quality: Breathhold, GI contrast, ASSET calibration, Optimizing slice thickness and field of view GI contrast: Radiologist options beyond Gastromark era Predicting location of appendix based on duration of pregnancy Patient weight and size issues: 325 to 500 pound weight limit based on the MR scanner Limitation due to Gadolinium contraindication

SUMMARY

1. MR is the imaging modality of choice for pregnant patient with suspected appendicitis where the US results are either inconclusive or nondiagnostic.
2. MR offers the unque advantage of better contrast resolution, and comparable sensitivity compared to CT.
3. Per safety Committee of the Society for Magnetic Resonance Imaging, MR imaging may be used in pregnant women if other nonionizing imaging are inadequate or if the MR provides important information that would otherwise require exposure to ionizing radiation.

A Look through CT Soft Tissue Windows: Frequently Overlooked Findings in CTs Done in Trauma Patients

LL-ERE1191

Uma Thakur , MD
Cornelia B Wenokor , MD

PURPOSE/AIM

The purpose of this exhibit is to recognize critical findings frequently overlooked on soft tissue windows of musculoskeletal CTs obtained for trauma.

CONTENT ORGANIZATION

This will be a case based presentation. Approximately 20 cases will be presented displaying findings frequently overlooked on CT soft tissue windows, including: entrapped iliopsoas tendon, bone marrow infiltration in a patient with bilateral femoral neck fractures, Morel Lavallee lesions, ligamentous and meniscal injury in the knee, dislocated ankle flexor and peroneal tendons, compartment syndrome and Achilles tendon tear.

SUMMARY

In the setting of trauma, CT is the preferred modality due to its rapid acquisition of images. Findings traditionally reserved for diagnosis on MR such as tendinous and ligamentous pathology can frequently be discerned from CT as well. It is important to be aware of the information available on soft tissue windows and to be able to recognize emergent findings. The detection of soft tissue pathology from CT can result in increased efficiency of care by decreasing reporting time and offsetting cost by obviating the need for MR in some cases. Finally, diagnosis of emergent findings from CT becomes especially critical in the subset of patients who cannot receive MRs.

Adrenal and Renal Nontraumatic Emergencies: An Imaging Review of Infection, Inflammation and Vascular Abnormalities

LL-ERE1192

Aaron H Baer , MD
Suzanne T Chong , MD
Ania Z Kielar , MD
Peter S Liu , MD
Michael Mazza , MD
Richard H Cohan , MD *
James H Ellis , MD *

PURPOSE/AIM

To provide a comprehensive imaging review of nontraumatic emergencies involving the adrenal glands and kidneys.

CONTENT ORGANIZATION

A 10-year search of our radiology information system for US, CT and MRI cases of adrenal and renal infection, inflammation and vascular processes, yielded more than 1000 cases that were reviewed for this exhibit. Normal anatomy and relevant pathophysiology are reviewed. Imaging features of etiologies of acute primary and secondary adrenal insufficiency are demonstrated. Imaging of renal inflammatory and infectious processes, including urolithiasis and pyelonephritis, and renal vascular disorders such as hemorrhage, infarct, and renal artery

and venous abnormalities are presented. Clinical presentations, imaging findings that may affect management decisions, comparative utility of multimodality imaging and pearls/pitfalls are discussed.

SUMMARY

Nontraumatic conditions affecting the adrenal glands and kidneys are commonly encountered in the emergency room setting and can be life-threatening if not expeditiously addressed. After reviewing this exhibit, a radiologist will have a comprehensive understanding of the imaging findings in these processes.

Iatrogenic Renal Trauma: Comprehensive Imaging Review of the Post-procedural Kidney and Complications Presenting Acutely to the ER

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LL-ERE1193

Michael J Ryan, MD
Suzanne T Chong, MD
Ania Z Kielar, MD
Jonathan M Willatt, MBChB
Ursula S Knoepp, MD
Jenny J Zhao, MD
James H Ellis, MD *
Richard H Cohan, MD *

PURPOSE/AIM

To review the imaging appearance of the post-procedural kidney and complications presenting emergently.

CONTENT ORGANIZATION

A 10-year search of our radiology information system identified patients who had ultrasound, CT, or MRI examination following partial nephrectomy and thermal ablation for treatment of renal cancer. Over 300 cases were identified, with imaging studies of these patients included in this exhibit. Nephron sparing treatments of partial nephrectomy and thermoablation and the imaging appearance of the post-procedural kidney in the immediate period and evolution over time are reviewed. Examples of emergent post-procedural complications, including infection, hemorrhage and vascular, collecting system and bowel injury, are shown. Imaging findings suspicious for tumor recurrence are also presented.

SUMMARY

Partial nephrectomy and percutaneous thermoablation are increasingly utilized to treat small renal tumors. Patients with acute or chronic complications can present to the Emergency Department. After reviewing this exhibit, the radiologist will have a thorough understanding of the imaging appearance of the normal post-procedural kidney and the complications encountered after nephron-sparing treatments. They will also be able to distinguish tumor recurrence from the normal post-operative appearance.

Non Traumatic Emergencies of the Spleen

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LL-ERE2576

Abdullah Alabousi, MD
Michael N Patlas, MD
Mariano Scaglione, MD
Luigia Romano, MD
Jorge A Soto, MD *

PURPOSE/AIM

To discuss the use of different imaging modalities for diagnosis of acute splenic abnormalities. Illustrate critical imaging findings in non traumatic splenic emergencies. To review management options with emphasis on interventional radiology techniques.

CONTENT ORGANIZATION

Multiple non traumatic splenic emergencies are encountered during imaging of emergency room patients. Occasionally, patients are investigated for symptoms of suspected splenic pathology (abscess, symptomatic splenic aneurysm and pseudoaneurysm, splenic torsion or rupture). However, more often, splenic emergencies (splenic masses, splenic vein thrombosis) are detected in emergency patients during evaluation of non specific abdominal pain. Cross-sectional imaging findings of the following non traumatic splenic emergencies will be illustrated and reviewed: splenic abscess and other acute infections; atraumatic splenic rupture; infarction; splenic torsion; complications of splenic artery aneurysm and pseudoaneurysm; splenic vein thrombosis; and focal splenic lesions in the context of emergent presentations. Differential diagnosis and management options will be discussed as well.

SUMMARY

This exhibit offers an opportunity to review the imaging appearance of non traumatic splenic emergencies and emphasizes the role of radiologists in detecting and managing these often life-threatening entities.

Resident Primer in Recognizing Pathologic Abdominal and Pelvic Air on CT: It's all about Being in the Right Place at the Right Time

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LL-ERE2578

Kathryn Nicholas, MD
Siva P Raman, MD
Karen M Horton, MD
Elliot K Fishman, MD *
Pamela T Johnson, MD *

PURPOSE/AIM

Recognizing extraluminal gas on CT is critical for identifying a range of life threatening pathologies. As a resident education tool, a quiz was designed to test residents ability to identify pathologic gas and distinguish this from other potential etiologies of air outside the bowel lumen.

CONTENT ORGANIZATION

CT technique:

- importance of windowing and MPRs

Each case is presented as an unknown, followed by key teaching points. Quiz cases will include (in random order):

- Gastrointestinal- diverticuli, benign and pathologic gastric and intestinal pneumatosis, pneumoperitoneum, mesenteric vein gas, intraperitoneal abscess
- Hepatic- portal vein, hepatic parenchymal gas
- Biliary- pneumobilia, emphysematous and gangrenous cholecystitis, choleintestinal fistula
- Pancreatic- ductal air, necrotizing pancreatitis, pancreatic tumor fistulization to bowel
- GU- emphysematous pyelonephritis, emphysematous cystitis
- Vascular- aortenteric fistula, enterocaval fistula
- Musculoskeletal- necrotizing fasciitis, Fournier's gangrene

SUMMARY

Air outside of the gastrointestinal tract is often the harbinger of critical pathology. After reviewing this exhibit, residents will gain an understanding of the CT appearance of air in a range of abnormal anatomic locations and the clinical significance.

LL-ERE2579

Tadeusz W Stadnik, MD
Luisa Divano, MD
Chiara Mabiglia, MD
Johan De Mey *

PURPOSE/AIM

- 1.To review the clinical signs pointing for the possibility of dural sinus thrombosis (DST).
- 2.To discuss the imaging flow charts useful in the diagnosis of DST.
- 3.To provide the diagnostic clues how to avoid false positive or negative diagnosis of DST.
- 4.To provide imaging tutorial with interactive presentation of clinical cases.

CONTENT ORGANIZATION

1. Pathophysiology and clinical presentation of DST.
2. Clinical red flags pointing to the possibility of DST and differential diagnosis.
3. Review of typical imaging findings including CT and MRI.
 - Discussion of the most useful MRI sequences, different MRI angiography settings, including typical artifacts.
 - Discussion of typical "false positive DST" on MRI including normal variants.
 - Comparison between MRI and CT including CT Angiography.
4. Sample cases and mimics.
5. Conclusion and Take home points.

SUMMARY

The history of recent headache especially when associated with neurological signs rise the possibility of DST. The delayed or inaccurate diagnosis may have fatal issue with major medico-legal concerns. The knowledge of typical mimics of thrombosis and of normal variants is essential for reliable diagnosis.

Resident Primer in Recognizing Acute Hemorrhage on Non Contrast and IV Contrast Enhanced CT**LL-ERE2580**

Erin N Zingarelli, BS
Siva P Raman, MD
Karen M Horton, MD
Elliot K Fishman, MD *
Pamela T Johnson, MD *

PURPOSE/AIM

Identification of acute hemorrhage on CT is critical for patient management. Residents must be both adept and confident in their ability to recognize acute hemorrhage and active contrast extravasation, to facilitate emergent intervention when indicated. This exhibit presents, in quiz format, a range of cases of abdominal and pelvic hemorrhage, with key teaching points to aid in characterization.

CONTENT ORGANIZATION

CT technique and interpretation:

- noncontrast CT findings
- importance of scan timing
- IV contrast enhanced CT findings (recognizing active extravasation)
- distinguishing hemorrhage from mimics (fracture fragment, surgical material)

Quiz cases (presented in random order):

- trauma patient- penetrating trauma, fracture
- tumor- HCC, angiomyolipoma, renal cell carcinoma
- anticoagulated patient- spontaneous retroperitoneal, pelvic
- iatrogenic- postoperative, following vascular intervention
- vascular pathology- aneurysm, pseudoaneurysm, dissection

SUMMARY

After reviewing this exhibit, participants will gain an understanding of the range of appearances of acute hemorrhage, the importance of IV contrast administration and proper timing to identify active bleeding, and the various pathologies that cause abdominal and pelvic hemorrhage.

Resident Primer in Identifying Acute Abdominal and Pelvic Arterial and Venous Thrombus and Associated Complications on CT**LL-ERE2581**

Linnan Tang, PhD
Siva P Raman, MD
Karen M Horton, MD
Elliot K Fishman, MD *
Pamela T Johnson, MD *

PURPOSE/AIM

Acute arterial and venous thrombus can be life threatening and must be recognized to promptly initiate treatment. This exhibit reviews the CT appearance and potential complications of acute thrombotic pathology in the abdomen and pelvis.

CONTENT ORGANIZATION

CT technique and interpretation (pearls and pitfalls)

- venous phase timing to avoid 'pseudothrombus'
- acute thrombus on non-contrast CT
- distinguishing bland from tumor thrombus in setting of malignancy
- importance of MPRs to identify mesenteric arterial and venous thrombus

Quiz cases (presented in random order):

- Aortoiliac thrombosis (acute vs chronic)
- Mesenteric arterial thrombus and recognizing bowel ischemia
- Portal and splenic vein thrombus (acute vs chronic, bland vs tumor thrombus)
- Hepatic venous thrombosis and Budd Chiari syndrome
- Superior mesenteric vein and risk of bowel ischemia
- Inferior mesenteric veins and predisposing conditions (eg acute diverticulitis)
- Renal vein thrombosis (bland vs tumor)
- Gonadal vein thrombus and risk of pulmonary embolism

- Iliac and femoral vein thrombus (acute vs chronic)

SUMMARY

After review of this exhibit, residents will gain an understanding of the CT findings and potential sequela of acute abdominal and pelvic thrombus to expedite management.

Lower Extremity Arterial Runoff CT in the Emergency Room: Technique and Review of Common/Unusual Imaging Findings

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LL-ERE2582

Neil Hansen , MD
Matthew J DeVries , MD
Peter S Liu , MD
Ryan O'Malley , MD
Katherine E Maturen , MD
William J Weadock , MD *

PURPOSE/AIM

Lower extremity Computed Tomographic Angiography (CTA) is replacing catheter angiography as the initial imaging modality to evaluate for an emergent vascular condition in the lower extremities. Additionally, lower extremity CTA can be quickly added to the initial body CT obtained in the initial trauma workup. This can lead to expeditious diagnosis of vascular injury and facilitate prompt limb salvage. This exhibit will review techniques for optimal lower extremity CTA image acquisition. Additionally, the imaging manifestations of lower extremity vascular emergencies will be presented.

CONTENT ORGANIZATION

1.) Technical parameters utilized to obtain optimal image acquisition for arterial runoff CTA in the emergency setting will be reviewed. 2.) Imaging manifestations of common and unusual lower extremity vascular pathologies encountered in the emergency setting will be presented and discussed. 3.) Management of emergent lower extremity vascular disorders diagnosed with CT will be reviewed.

SUMMARY

Knowledge regarding optimal image acquisition and interpretation of lower extremity CTA studies is essential to all radiologists working in the emergency room setting. Additionally, familiarity with the imaging manifestations of emergent lower extremity vascular conditions as well as their management will enable better care of these patients.

Blunt Splenic Trauma: A Pictorial Review of CT Findings, Angiographic Correlation, and Successful Embolization at a Level I Trauma Center

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LL-ERE2583

Rahul Nayyar , MD
Krishna K Das , MD
Muhammad A Naveed , MD
Megha Nayyar
Mohammed Jawed , MD

PURPOSE/AIM

This exhibit will demonstrate examples of splenic trauma seen on CT that were followed by transcatheter arterial angiography and embolization. We will review vascular anatomy, American Association for the Surgery of Trauma (AAST) splenic injury scale, clinical considerations, indications, technique, and potential complications for splenic artery embolization. The aim of this exhibit is to share our experience with splenic trauma, subsequent CT findings and angiographic/embolization correlates. Recognizing key imaging findings and potential management that can be provided by radiologists is important for residents to be aware of in ensuring optimal and timely patient care.

CONTENT ORGANIZATION

1) Introduction to blunt splenic trauma and role of CT. 2) Vascular anatomy. 3) AAST splenic injury scale. 4) Clinical Considerations. 5) Indications, technique, and potential complications for splenic artery embolization. 6) Multimodality radiographic correlations (CT, Angiography, and Embolization). 7) Take home messages and conclusion.

SUMMARY

Radiology is vital to the diagnosis and treatment of patients presenting with blunt splenic trauma. We will illustrate the imaging features of splenic injury and treatment. This educational exhibit serves to demonstrate the integral role of the radiologist in caring for patients presenting with blunt splenic trauma.

Out of Sight: Imaging of Traumatic and Non-traumatic Causes of Vision Loss

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LL-ERE2584

Robert J Dym , MD
Daniel Krieger , MD
Meir H Scheinfeld , MD
Alain Cunqueiro , MD
Judah Burns , MD

PURPOSE/AIM

Patients presenting with a visual deficit have numerous potential underlying pathologies, which may be traumatic or non-traumatic in etiology. Imaging is often used to reveal or further evaluate these conditions. The purpose of this exhibit is to review the CT and MR imaging appearances of the spectrum of conditions involving the visual pathway and to illustrate how they each result in a specific form of vision loss.

CONTENT ORGANIZATION

This exhibit reviews the following causes of vision loss: *Traumatic*

- Orbital fracture
- Retrobulbar hemorrhage
- Traumatic optic neuropathy
- Globe rupture
- Retinal and choroidal detachment/hemorrhage

Non-traumatic

- Orbital mass or pseudotumor
- Ocular mass
- CMV chorioretinitis
- Ophthalmitis
- Optic neuritis
- Optic nerve mass
- Optic chiasm compression by mass
- Optic radiation infarct
- Occipital lobe infarct
- Brainstem infarct involving cranial nerve nucleus or MLF

SUMMARY

The visual pathway is long and complex, and pathology anywhere along this pathway, from the globe and orbit to the occipital lobe and brainstem, can lead to various forms of vision loss. Most of these abnormalities can be assessed using imaging; as such, radiologists should be familiar with their unique imaging appearances and expected corresponding visual deficits.

Different Strokes for Different Folks: The Many Forms of Brain Infarction

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LL-ERE2585

Robert J Dym, MD
Lawrence Cabusora, MD
Judah Burns, MD
Alain Cunqueiro, MD
Meir H Scheinfeld, MD

PURPOSE/AIM

Stroke comes in many different forms. The type of stroke may suggest a specific etiology, which may correlate with certain patient demographics, or may reflect an anatomic variation. Accurate stroke characterization may affect workup and management or alter prognosis. The aim of this exhibit is to review the imaging patterns and causes of the many different types of strokes.

CONTENT ORGANIZATION

We will review the following types of stroke:

- Large cerebral vessel thromboembolism (dense MCA, PCA, basilar artery)
- Distal cerebral vessel embolic disease (including MCA dot sign)
- Lacunar infarction
- Watershed cerebral infarction
- Global hypoxic ischemic injury
- Carbon monoxide poisoning
- Infarctions in the setting of variant anatomy (e.g. fetal PCA, AICA-PICA variant)
- Venous infarction
- Hemorrhagic conversion of ischemic infarct
- Primary hemorrhagic "stroke" (due to hypertension, amyloid)

SUMMARY

Patients with different risk factors can have different types of strokes. The differing pathophysiology of these various forms of infarction may have important implications for further diagnostic workup, management and prognosis. Radiologists should therefore be familiar with the many forms of stroke and should attempt to elucidate stroke etiology when possible.

Updates and New Concepts on Multi-detector Computed Tomography (MDCT) Imaging of Blunt Hepato- Biliary and Splenic Trauma

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LL-ERE2586

Jun Wang, BSc
Teresa Liang, MD, BSc
Graeme J McNeill, MRCP, FFRCRCSI
Savvas Nicolaou, MD

PURPOSE/AIM

1. Review mechanism of injury, grading, and characteristic findings on MDCT, US and HIDA scan of blunt hepato-biliary/splenic trauma
2. Review new dose reduction strategies and imaging protocols
3. Review utility of imaging in management and follow up of complications

CONTENT ORGANIZATION

- Mechanism of injury and clinical assessment of blunt hepato biliary/splenic trauma and associated complications
- Various imaging modalities available with emphasis on MDCT as the most definitive imaging modality
- Review the AAST grading and its limitations, (ex. identification of pseudoaneurysms, av fistula) and review MDCT grading with imaging examples of characteristic findings
- New dose reduction techniques such as iterative reconstruction and kVp modulation to lower radiation dose exposure in the trauma setting
- Usefulness and limitations of MDCT, with focus on ability in the setting of determining appropriate intervention
- Review management and propose a potential imaging algorithm for hepato-biliary/splenic trauma injuries and delayed complications

SUMMARY

Major teaching points:

- imaging findings and spectrum of injury on MDCT, and implications on conservative vs operative management
- new dose reduction strategies using MDCT
- Role of follow up imaging and provide an imaging algorithm initial assessment and follow up

Body Imaging in Pregnancy - Emergent Findings

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LL-ERE2587

Aizaz L Shaikh, MD
Robert S Hicks, MD
Robert M Lerner, MD, PhD

PURPOSE/AIM

The goal is to review different emergent imaging characteristics in body imaging during pregnancy which can be identified with radiographic imaging, ultrasound, CT, MRI, and MRCP. Non-ionizing imaging modalities should be utilized in evaluating pregnant patients. However, it is also important to recognize emergent situations when pregnancy status is unknown and nonconventional methods are used.

CONTENT ORGANIZATION

This educational exhibit will utilize case examples of body imaging in pregnancy that should be recognized urgently. Examples of radiographic imaging, ultrasound, CT, MRI, and MRCP will be utilized. Topics will include different types of ectopic pregnancy, molar pregnancy, acute appendicitis, acute cholecystitis, choledocolithiasis, and ureterolithiasis.

SUMMARY

Recognizing emergent findings with different modalities in body imaging during pregnancy is critical for patient care. Use of non-ionizing radiation should be utilized in pregnancy when possible.

Operation ÆœOMOIYARIİç½?: How to Reduce Radiation Dose in Trauma Panscan

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LL-ERE2588

Yasuyoshi Ogawa, RT
Kiyoko Tateishi

Junichi Matsumoto , MD
Jyuichi Mori
Yasuyuki Kobayashi , MD, PhD
Tatsuo Yoshikawa
Yasuo Nakajima , MD

PURPOSE/AIM

The purpose of this exhibit is; 1. Understanding quality of trauma panscan depends not only on scan time and image quality but also on dose reduction. 2. To explain various methods for radiation dose reduction in trauma panscan with their difficulty levels and reduction ratios.

CONTENT ORGANIZATION

1. Significance of trauma panscan in trauma care 2. Quality of trauma panscan: Scan time, image quality, and radiation dose 3. Radiation Dose Reduction Techniques: difficulty levels and reduction ratios will be indicated with numbers of stars. 3-1: How to utilize CT automatic tube current modulation combined with variable pitch helical scan. 3-2: How to optimize patient positioning. 3-3: How to use iterative reconstruction technique. 3-4: How to control radiation dose per scan within same examination or per examination for same patient.

SUMMARY

MDCT plays major role in trauma care and has become essential diagnostic tool. Radiologists and radiologic technologists should understand significance of radiation dose reduction in trauma panscan and its methodology. This exhibit explains how to do those methods with information of difficulty levels and reduction ratios of them. 'OMOIYARI (compassion)' is the essence of trauma panscan.

Reading between the Columns: Using 3D Images to Categorize Acetabular Fractures

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LL-ERE2589

Akiva A Dym , BS
Robert J Dym , MD
Laura L Avery , MD
Meir H Scheinfeld , MD

PURPOSE/AIM

The purpose of this exhibit is:

- To review acetabular anatomy.
- To describe the ten classic patterns of acetabular fracture with emphasis on their appearance using 3D images

CONTENT ORGANIZATION

The following topics will be covered:

- Acetabular anatomy using axial and 3D surface rendered CT images.
- How to construct a 3D disarticulated acetabulum from source axial CT images.
- How to classify acetabular fractures by comparing 3D images to a standard set of acetabular fracture images.

SUMMARY

The major teaching points of this exhibit are:

- The acetabulum can be divided into an anterior column and wall and a posterior column and wall.
- 3D surface rendered images of the acetabulum can be constructed using various software packages by excluding the femoral head on the source axial images and then viewing as a 3D image.
- Comparing acetabular fracture line patterns (when viewing the 3D disarticulated acetabulum from the lateral side) to standard images allows for intuitive understanding and classification of acetabular fractures.

Multi Planar Reformations (MPR) and Three-dimensional (3D) Imaging with 128-slice Multidetector CT of Head and Spine Injuries in the Emergency Room: A Pictorial Review

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LL-ERE2590

Ronald Booij , RT
Wim Vermeule , RT
Galiel S Muradin , MD

PURPOSE/AIM

- To learn how to benefit from MPR and 3D imaging in trauma imaging of the head and neck
- To recognize pitfalls and to learn how to deal with them
- Demonstrate how to create fast and robust scan- and post-processing protocols

CONTENT ORGANIZATION

Introduction

What is MPR and 3D imaging? Dataset requirements

- Kernel
- Slice thickness
- Increment
- Scan- and display FOV

Technical improvements and reconstruction challenges

- Isotropic voxels
- Surgical planning

Scan protocol optimization

- Workflow
- Easy to use presets in 3D imaging
- Scan and reconstruction parameters

Clinical examples of head and neck injuries

- Hanging
- Bullet in head
- Foreign object in head and neck
- Bechterew broken spine
- Crush injuries
- Car/motor accident

Take home messages

SUMMARY

MPR and 3D imaging are known techniques in CT imaging. Quick and robust post-processing of trauma injuries of the head and neck can

support an optimal surgical planning and proper assessment of the severity of the injury. This exhibit will show the clinical value of these techniques and provide tips and guidelines in order to create head and neck trauma imaging and post-processing protocols

Imaging Updates of Judet-Letournel Acetabular Fractures with Axial CT Imaging and Rotating 3D Reconstruction

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LL-ERE2591

Yauk Lee, MD
Mingming Ma, MD
Tudor H Hughes, MD

PURPOSE/AIM

- 1) To review the Judet-Letournel classification system of acetabular fractures
- 2) To update the appearance of each fracture type on axial CT imaging and rotating 3D reconstruction using an organized approach with an emphasis on anatomy

CONTENT ORGANIZATION

- 1) Illustrate cases demonstrating the 10 different acetabular fracture types based on the Judet-Letournel classification
 - a) Highlight the axial CT imaging findings using an organized approach
 - b) Correlate the axial CT imaging findings with rotating 3D reconstruction emphasizing anatomical landmarks
- 2) Review the 3 most common surgical approaches
- 3) Review predictors of poor outcome including fracture impaction, comminution, and displacement

SUMMARY

- 1) The Judet-Letournel classification system allows a methodical approach to acetabular fractures
- 2) Rotating 3D reconstruction help conceptualize each fracture type
- 3) Axial CT imaging and rotating 3D reconstruction are vital for pre-surgical planning by
 - a) accurately identifying fracture type
 - b) identifying complications associated with poor outcome

The Leaky Basin: A Review of Imaging Techniques and Spectrum of Non-osseous Injuries in Blunt Pelvic Trauma

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LL-ERE2592

Ananya Panda, MBBS, MD
Atin Kumar, MD
Shivanand R Gamanagatti, MBBS, MD
Arun K Gupta, MBBS, MD

PURPOSE/AIM

- 1) To depict role of multimodality imaging in blunt pelvic trauma
- 2) To depict spectrum of soft tissue and vascular pelvic injuries

CONTENT ORGANIZATION

The purpose of this exhibit is to describe the imaging indications, techniques and spectrum of non-osseous injuries in blunt pelvic trauma. The imaging techniques discussed will include retrograde urethrography, micturating cystourethrography, MDCT with CT cystography and diagnostic angiography. We will discuss when and how to perform these techniques in the setting of blunt pelvic trauma.

This will be followed by depicting the spectrum, types and imaging appearances of soft tissue and vascular injuries such as:

- 1) Bladder injuries
- 2) Urethral injuries
- 3) Rectal injuries
- 4) Vascular injuries with interventions

SUMMARY

- Blunt pelvic trauma can present with a variety of findings, ranging from isolated as well as concomitant visceral and vascular injuries.
- MDCT is the mainstay for complete evaluation of pelvic trauma. Other investigations like RGU, MCU also have their place in the arsenal of trauma radiologist to rule out lower genito-urinary injuries.
- Vascular injuries can be successfully managed with interventional radiology.
- Familiarity with diagnostic approach, indications and imaging appearances in blunt pelvic trauma is essential.

A New Look at an Old Conundrum: Spontaneous Intra-Abdominal Haemorrhage from the Radiologist's Perspective

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LL-ERE2593

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Tanzilah A Barrow, MBChB
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Subhasis Basu, MBBS, FRCR
Velauthan Rudralingam, MBChB
Sathi A Sukumar, MD

PURPOSE/AIM

This exhibit aims to:

1. Illustrate CT findings of spontaneous intra-abdominal haemorrhage.
2. Demonstrate common imaging pitfalls, through on call cases, in diagnosing non-traumatic non-iatrogenic intra-abdominal haemorrhage.
3. Discuss the spectrum of common and uncommon causes.

CONTENT ORGANIZATION

1. Etiology of spontaneous haemorrhage and anatomical locations of blood.
2. Review of main learning points for the on-call radiologist.

On call case examples to include:

- Coagulopathy-related (thrombocytopenia in bowel lymphoma)
- Gynaecological (haemorrhage from corpus luteal cyst, ruptured ectopic pregnancy)
- Vascular (hepatic artery pseudoaneurysm, ruptured abdominal aortic aneurysm, segmental mediolytic arteriopathy)
- Visceral (adrenal haemorrhage, splenic secondary to infectious mononucleosis, hepatic adenoma and renal tumour)
- Miscellaneous (misdiagnosed retroperitoneal haemorrhage, pelvic wall haematoma)

SUMMARY

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

- A sound anatomical knowledge of peritoneal compartments and visceral haematoma location is key in identifying the likely source of haemorrhage.
- On-call radiologists need to be aware of the spectrum of CT appearances of spontaneous intra-abdominal haemorrhage and its

A New Classification Scheme for Treating Blunt Aortic Injuries Using Curved Planar Reformations and High-Pitch CT

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LL-ERE2594

Alessandro A Lemos, MD
James M Sternberg, MD
Luke Bonello, MD
Caterina C Giannitto
Pietro R Biondetti, MD

PURPOSE/AIM

The purpose of this exhibit is: 1.To review the classification of blunt aortic injuries (BAI) 2.To discuss the usefulness of a new classification scheme for treating BAI 3.To explain the utility of automated generation of Curved Planar Reformations (CPR) in the emergency setting

CONTENT ORGANIZATION

The content of this exhibit will be organized into the following general sections: 1) depiction of the new classification scheme of BAI. Type of aortic injury and definition 2) definition of CPR 3) definition of high-pitch CT -Review of imaging findings Case examples, each consisting of : a) summary of clinical presentation, epidemiology and pathophysiology, c) demonstration of key MDCT images with CPR correlation 'in motion', volume rendering (VR) and maximum intensity projection (MIP) reconstructions c) review of conservative vs.surgical management

SUMMARY

The major teaching points of this exhibit are: 1. The combination of CPR and high-pitch CT along with the new scheme classification allows a prompt assessment of BAI 2.The ability to rotate the image trough 360° facilitates a better understanding of anatomic relationships and the lesion under study 3. This technique adds value to CT angiography and has the potential to promote its widespread acceptance and use in the emergency setting

Tract and Field: Imaging in Sports-Related GU Trauma

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LL-ERE2595

Christine O Menias, MD
Sanjeev Bhalla, MD
Vincent M Mellnick, MD
Constantine A Raptis, MD
Cary L Siegel, MD
Nirvikar Dahiya, MD

PURPOSE/AIM

- To review the spectrum of sports-related GU trauma and their implications of management
- To review imaging algorithms in evaluating GU trauma: Ultrasound, urethrography, and CT
- To illustrate the spectrum of sports-related injuries of the kidney, bladder, urethra, and scrotum

CONTENT ORGANIZATION

- Unique injuries of GU tract related to sports-related injuries
- AAST classification of renal injuries
- Intraperitoneal and extraperitoneal bladder ruptures
- Classification of urethral injuries
- Injuries to scrotum and testes
 - o Special Issues in Pediatrics

SUMMARY

MDCT is valuable in the evaluation of patients who sustain sport-related injuries. The majority of renal injuries incurred during sports-related trauma are contusions and minor parenchymal lacerations amenable to nonoperative management. Urethral injuries are common in bicycling injuries, and associated with pelvic fractures. Knowledge of proper imaging techniques for GU injuries including excretory phase imaging, and urethrography is imperative for proper triage in management

Distal Radius Fractures: What the Orthopedic Surgeon Wants to Know

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LL-ERE2596

Paul M Bunch, MD
Scott Sheehan, MD
George Dyer
Aaron D Sodickson, MD, PhD
Bharti Khurana, MD

PURPOSE/AIM

1. Provide an intuitive understanding, through the use of 3D models and animations, of the biomechanics of the most common distal radius fractures.
2. Review the most common classification, grading, and reporting systems of distal radius fractures used by orthopedic surgeons.
3. Discuss treatment implications of key imaging findings.

CONTENT ORGANIZATION

1. Review the relevant anatomy of the distal radius and its articulations.
2. Illustrate common mechanisms of injury with 3D modeling and animation.
3. Illustrate the most commonly encountered osseous and soft tissue injury patterns seen with distal radius fractures.
4. Describe the classification systems of distal radius fractures most commonly used by orthopedic surgeons with emphasis on the Fernandez and Jupiter classification.
5. Review critical imaging features on follow-up imaging.
6. Case-based review of 'don't miss' injuries.

SUMMARY

The major teaching points are: 1. Knowledge of the biomechanics of the most common distal radius fractures. 2. Understanding of the classification and grading systems used by orthopedic surgeons when managing distal radius fractures. 3. How to effectively report the most clinically significant findings that guide the orthopedic surgeon's management.

Imaging Geriatric Trauma: Age Matters

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LL-ERE2597

Claudia T Sadro, MD
Claire K Sandstrom, MD
Nupur Verma, MD
Martin L Gunn, MBChB *

PURPOSE/AIM

1. Demonstrate classic injuries in geriatric patients that may occur from seemingly minor trauma and their potential complications.
2. Outline a protocol for imaging geriatric trauma patients who sustain major trauma and seemingly minor trauma.

CONTENT ORGANIZATION

1. Epidemiology of geriatric trauma. 2. Head injury and the importance of anticoagulant use. 3. Vertebral injury and the importance of CT and MRI. 4. Rib fractures and sternal fractures and associated complications. 5. Extremity fractures, especially the occult hip fracture, and the use of CT and MRI. 6. Torso trauma and the role of intravenous contrast.

SUMMARY

The geriatric population over 65 years of age is the most rapidly growing sector of the United States population, and emergency departments are seeing increasing numbers of geriatric trauma patients. Geriatric patients are at increased risk for injury even from relatively minor trauma. Because of advanced age, radiation concerns from CT are not as significant in geriatric patients as they are in younger adults. Osteoporosis and degenerative changes make the diagnosis of vertebral and extremity fractures less accurate with x-ray, and radiologists should incorporate CT and MRI into geriatric imaging algorithms. Consideration should be given to renal function and severity of trauma when making decisions about intravenous contrast.

Emergency Radiology Abdominal Ultrasound Quality Assurance: How to Avoid the Pitfalls

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LL-ERE2598

Caitlin M Connolly, MD
Robin B Levenson, MD
Karen S Lee, MD

PURPOSE/AIM

1. To present the top five categories of quality assurance (QA) errors in emergency radiology abdominal ultrasound (US) at our institution.
2. To review imaging features related to these cases to help radiologist recognize the most common missed and misinterpreted findings.
3. To understand optimization of technical aspects of abdominal US.

CONTENT ORGANIZATION

The top five categories of emergency radiology abdominal US QA errors at our institution (urban, tertiary care) over a 9 year period will be presented. Imaging features, pearls and pitfalls will be discussed with multiple case examples. 1. Acute cholecystitis/ gangrenous cholecystitis 2. Liver lesions a. Missed lesions b. Misinterpreted lesions 3. Renal transplants a. Imaging vasculature b. Hydronephrosis 4. Portal vein thrombus a. Missed and overcalled thrombus b. Bland vs tumor thrombus 5. Technical factors including: a. Standard protocol b. Depth and focus c. Vascular imaging

SUMMARY

1. The top emergency radiology abdominal US QA issues are misdiagnosis related to acute cholecystitis, liver lesions, renal transplant, and portal vein thrombus as well as technical factors that may hinder appropriate diagnosis.
2. Radiologist awareness of US imaging feature of these entities and pitfalls in diagnosis is imperative to help avoid errors.
3. Optimizing technical aspects of abdominal US is key.

The Fatal Blush: A Pictorial Review of the Appearances of Contrast Extravasation on Computed Tomography Scans in the Multi-injured Patient with Severe Pelvic Trauma

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LL-ERE2599

Jane A Topple, MBBS
Deborah Low, FRCR, MBBS

PURPOSE/AIM

- 1) To improve the recognition of contrast extravasation in the patient with severe pelvic injury through a pictorial review of the salient features of extravasation and its common associations.
- 2) To present our reporting rates for active contrast extravasation in cases of complex pelvic injury and how this finding influences management.

CONTENT ORGANIZATION

- Features of active extravasation in pelvic injury:
 - a localised or diffuse focus of high density lacking geometric margins
- Associations with pelvic extravasation:
 - pelvic and retroperitoneal haematoma
 - pelvic fracture and/or pelvic joint disruption
 - extraperitoneal bladder rupture
- Fracture patterns predictive of pelvic haemorrhage:
 - sacroiliac joint disruption
 - multiple pelvic ring fractures
 - pubic ramus fractures with disruption of the pubic symphysis
- A review of our institutional outcomes when contrast extravasation is reported

SUMMARY

Complex pelvic fractures are common in the setting of the multi-injured trauma patient and are associated with a high mortality. The most common cause of death following severe pelvic injury is massive haemorrhage. Through swift computed tomographic scanning and early recognition of active extravasation by the on-call radiologist, rapid transfer of the patient to the interventional or surgical team can take place.

Slip, Hit and Click is the Sound of a Broken Hip: MR Imaging of Occult Hip and Pelvic Fractures in the Emergency Department

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LL-ERE2600

Efren J Flores, MD
Timothy Meehan, MD, MS
Laura L Avery, MD

PURPOSE/AIM

After review of the exhibit, the viewer will gain a better understanding of the utilization of MRI for evaluation of occult hip and pelvic fractures of non-weight bearing patients in the emergency setting. The viewer will be familiar with the MR appearance of these fractures and emphasis will be placed on proper imaging utilization.

CONTENT ORGANIZATION

This presentation will include common and uncommon occult fractures of the pubic rami, iliac bones, sacrum and hip. This review will be organized in a case based format with: 1. Different clinical scenarios and presentations. 2. Accompanying radiographic and MR findings. 3. Discussion of the MR sequences that are key to diagnose occult pelvic and hip fractures in each setting with MR appearance. 4. Algorithmic approach with tips to tailor MRI sequences for occult fractures.

SUMMARY

Elderly and osteopenic patients frequently present to the Emergency department with pelvic pain or inability to bear weight with initial radiographic evaluation that may be negative. This exhibit will present the value of MRI to promptly diagnose occult fractures of the pelvis in the non-weight bearing patient, and to develop a standard algorithm for these cases. The goal is to triage and image these patients expeditiously and recognize the appearance of these fractures, as diagnostic accuracy determines management.

Sub-axial Cervical Spine Injury Classification System (SLIC): Introduction to a New Classification of Sub-axial Cervical Spine Injuries

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LL-ERE2601

Nicholas M Beckmann , MD
Manickam Kumaravel , MD, FRCR
Susanna C Spence , MD

PURPOSE/AIM

The purpose of this exhibit is to: 1. Review the current classification systems for cervical spine injuries 2. Introduce the new SLIC system of classifying sub-axial cervical spine injuries 3. Discuss advantages/disadvantages of new SLIC system compared to current classifications

CONTENT ORGANIZATION

Review of Cervical Spine Anatomy Current Classifications of Cervical Spine Injury Mechanism of injury based Flexion, Extension, Lateral flexion, Axial Loading **SLIC Classification of Cervical Spine Injury** Three components of SLIC classification 1. *Injury morphology*: compression, distraction, translation/rotation 2. *Integrity of discoligamentous complex*: disk, spinal ligaments, facet capsule 3. *Neurological status*: intact vs. root injury vs. cord injury **Discuss point system used with SLIC system for determining operative vs. non-operative patients** Examples of applying SLIC classification to cervical spine injuries **Review Advantages/Disadvantages of new SLIC System**

SUMMARY

The main teaching points of this exhibit are: 1. Introduce a new classification system for sub-axial cervical spine injuries 2. Educate viewers on proper implementation of this classification system 3. Demonstrate how this new system can be used to help determine operative vs. non-operative cervical spine injuries

CT Imaging Reference of Pediatric Skull Normal Developmental and Variant Anatomy: Distinguishing Trauma from Normality

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LL-ERE2602

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Jamin Patel
Seyed Ameli-Renani , MBBS, FRCR
Kate Baskerville
Rosemary A Allan , MRCP, FRCR
Ioannis Vlahos , MRCP, FRCR *

PURPOSE/AIM

The normal developmental and variant anatomy of the skull base and of the calvarial synchondroses and sutures renders the review of infant and pediatric head trauma imaging challenging. This exhibit provides a high resolution CT reference atlas of age-related appearances and explains 3-D CT imaging techniques that improve the accuracy of differentiating trauma from normality.

CONTENT ORGANIZATION

Level 1 pediatric trauma center experience (0-12years age). High resolution axial CT images, multiplanar, volume and surface rendered reconstructions to demonstrate:

- Normal skull base developmental anatomy at key age stages
- Series of age related appearances of calvarial sutures with key points
- Variations of development (age, race, unrelated pathology) that may mimic trauma
- Other interpretation pitfalls (motion, technical, vascular)
- Technical factors to improve evaluation (gantry angulation, axial/helical, reconstruction kernels/thickness/intervals etc)
- Interpretative benefit and limitations of calvarial 3-D surface shaded images.
- Contrast with confirmed traumatic fractures

SUMMARY

We present a CT reference atlas of normal pediatric skull anatomy, supplemented by key anatomical points, highlighting potential interpretation pitfalls and providing technical tips to improve the differentiation of trauma from normality.

Unclean Sweep: Duodenal Pathology in the Emergency Department Patient

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LL-ERE2603

Courtney H Bradenham , MD
Yaseen Oweis , MD, MBA
Vincent M Mellnick , MD
Constantine A Raptis , MD
Christine O Menias , MD

PURPOSE/AIM

The duodenum can be an oft-overlooked site of disease in the emergency department patient, but is frequently be the site of pathology:, including inflammation and infection, ischemia, obstruction, perforation, and hemorrhage. This pictorial review will discuss common (and some uncommon) conditions causing these presentations in the duodenum. We will also focus on CT findings of these diseases as it is often the first line test used in these clinical scenarios.

CONTENT ORGANIZATION

1. Duodenal anatomy and CT technique considerations 2. Duodenal Inflammation/Infection:

- Peptic ulcer disease
- Zollinger-Ellison syndrome
- Diverticulitis
- Groove pancreatitis
- Crohn disease 3. Duodenal Obstruction:
 - Malrotation/Volvulus
 - SMA syndrome
- Malignancy 4. Duodenal Perforation:
 - Ulcers
 - Trauma
 - Iatrogenic 5. Duodenal Hemorrhage

SUMMARY

Although a short segment of small bowel, the duodenum can be a frequent site of disease leading to presentation in the emergency department. Knowledge of these diseases and their CT appearance is highly important for the ED radiologist to appropriately diagnose the condition(s) and guide management.

Ocular Injuries in Afghanistan during 5 Months of Operation Enduring Freedom

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LL-ERE2604

David A Paz , MD

PURPOSE/AIM

To review ocular injuries sustained in Afghanistan from explosive blast and how eye protection plays a role in decreasing adverse outcomes.

CONTENT ORGANIZATION

NATO Role 3 Multinational Medical Unit, Kandahar Afghanistan, one of the busiest combat hospitals, receives NATO/Coalition and Afghan medical evacuation patients from the majority of Afghanistan. During a 5 month period, 276 combat casualties were received, most frequently from explosive injury. 45 of these patients sustained ocular injury and had further evaluation by the ophthalmologist and radiologic imaging. Only 1 of 24 casualties that was wearing eye protection sustained an open globe while 9 of 21 patients casualties that were not wearing eye protection suffered open globes with poor visual outcome.

SUMMARY

A significant disparity was noted between the ocular injury patterns of U.S. and Coalition forces in comparison with their Afghan counterparts, which were overwhelmingly due to the use, or lack thereof, of eye protection. Computed Tomography imaging demonstrated the spectrum of ocular injuries that can result from an explosive blast.

Whole Body Computed Tomography (WBCT) For Trauma: How High Is The Radiation Dose And How To Reduce It?

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LL-ERE2605

Victoria Burrows , MBChB
John J Harvey , MBBS
Claire Sutherland
Peter McGookin
Elizabeth Larkin
Andrew T West , MBBS

PURPOSE/AIM

To review WBCT radiation dose and methods for dose reduction.

CONTENT ORGANIZATION

Background Major trauma centres (MTC) were established in England in 2012 providing 24/7 access to WBCT, but there is poor awareness of the associated radiation burden. **Method** Retrospective review of adult trauma patients undergoing single phase WBCT (vertex-proximal femur) on a Siemens Somatom Definition Plus (128-slice) Emergency Department scanner in a UK MTC over 1 year. **Results** 505 patients with a mean age of 42 +/- 20 years had WBCT. Mean effective dose was 33.4 +/- 12.9 mSv. Using the BEIR VII estimates, this carries an additional lifetime attributable risk of fatal cancer of 1 in 600. **Dose Reduction Strategies** 1. **Think**: Is the scan justified? Could a focussed CT scan/US/MRI answer the question? 2. **Remove**: transfer device and monitoring equipment to reduce dose and artefact. **Reduce** tube current for small patients (**Iterative reconstruction**: Reduces the dose by 14-19% in trauma patients without compromising diagnostic quality. 4. **Position**: If no obvious upper limb injury, lift the patient's arms up before thorax and abdominal scans.

SUMMARY

Awareness of WBCT radiation dose and use of measures like **TRIP** could reduce the radiation burden of trauma patients.

Imaging Mistakes for the On-call Radiologist: Can We Avoid Them?

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LL-ERE2606

Henrique M Rodrigues , MD
Filipe Caseiro Alves , MD, PhD *

PURPOSE/AIM

To report difficult situations to which a Radiologist can be confronted in clinical practice and the lessons learned from mistakes.

CONTENT ORGANIZATION

The emergency shift is a stressful post for a radiologist; unexpected situations may trigger the need for quick diagnostic answers. Without the opportunity to consult or to quietly review cases, pressure to report may lead to anxiety, especially when patient outcome is heavily image-dependent. We think that a good way to learn and avoid mistakes is to share some of our lived situations at the on-call service.

Miss or near missed diagnosis will be presented due to subtle imaging findings that were not described or just marginally reported.

Examples include sealed gastric ulcer perforation by a blood clot, appendix detachment due to gangrenous appendicitis, Meckel's diverticulum perforation by impacted fish bone, non-occlusive mesenteric ischemia, obstructive internal hernias, aorto-caval fistula, groove pancreatitis, peritoneal lymphomatosis, etc.

The educational exhibit will display the signs that were insufficiently addressed contributing to diagnostic uncertainty, providing some useful tips.

SUMMARY

The exhibit will be displayed in the format of case-problem solving experiments and expects to teach by recognition of useful or important imaging signs that were not readily apparent.

Diagnosis of Biliary Stones and Strictures: Unique Pearls and Pitfalls of MRCP and 64-section and Higher MDCT

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LL-ERE2607

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PURPOSE/AIM

MR is increasingly being used for diagnosing abdominal emergencies. Over the last decade, MR quality has dramatically improved with the introduction of parallel imaging, 3D sequences, and improved coils. Simultaneously, with improvement in CT speed, thin sections can be acquired and images can be manipulated by way of MinIPs and curved planar reformat. Recent improvements in MDCT techniques as documented in the literature have rekindled the controversy of the relative roles of each imaging modality in the evaluation of stones and strictures. Unique pitfalls and diagnostic pearls are discussed from each modality using a wealth of cases from or institution over the last ten years.

CONTENT ORGANIZATION

1) Shared difficulties of diagnosing stones and strictures at MDCT and MRI (e.g. benign strictures vs. other causes of CBD dilation) 2)

Review of classic signs of stones and strictures at MDCT and MRI. 3) Image rich review of pearls and comon pitfalls at 64-MDCT (e.g. MinIPs and narrow window settings can result in false positive for stones) and MRI (e.g. false positives with pneumobilia, artifact from stents).

SUMMARY

The major teaching points of this exhibit are:

1. Old signs of stones and strictures are reevaluated given advances in MDCT and MRI.
2. Pearls and pitfalls which result from advances in these imaging modalities are reviewed.

Postmortem CT of Drowning: How Do We Evaluate the Corpses Discovered in Water?

LL-ERE2608

Tomonori Murakami
Masataka Uetani, MD
Kazuya Ikematsu

PURPOSE/AIM

The purposes of this exhibit are:

1. To present basic postmortem computed tomography (PMCT) findings of drowning
2. To correlate between PMCT findings and autopsy findings of the subjects who died of drowning

CONTENT ORGANIZATION

1. Pathophysiology and the classic autopsy signs of the death by drowning
2. Review of the PMCT findings of drowning
 - Aspiration
 - Froth in the airways
 - Fluid collection in the paranasal sinuses
 - Pulmonary edema
 - Distension of upper gastrointestinal tract
3. Comparison of PMCT findings of drowning with autopsy findings
4. Sample cases and pitfalls
5. Future directions and summary

SUMMARY

The major teaching points of this exhibit are:

1. PMCT findings of drowning should be distinguished from various postmortem changes.
2. PMCT can detect typical signs of drowning, such as froth in the airways, fluid collection in the paranasal sinuses, pulmonary edema and distension of upper gastrointestinal tract.
3. PMCT can demonstrate the traumatic change as well as signs of drowning, but it is usually difficult to distinguish antemortem from postmortem injuries on PMCT.

There is Nothing Cute about It: What Every Radiologist Should Know about Acute Aortic Disease

[Back to Top](#)**LL-ERE2609**

Elana B Smith, MD
Gunja P Parikh, MD
Thaddeus M Yablonsky, MD
Sean K Calhoun, DO

PURPOSE/AIM

At the conclusion of this presentation, the viewer should be able to:

- 1) Provide a differential diagnosis of the acute aortic diseases which have a similar clinical manifestation
- 2) Differentiate the radiologic appearances and discuss the key imaging features of aortic dissection, intramural hematoma, penetrating atherosclerotic ulcer, rupture of aortic aneurysm, and traumatic rupture of the aorta for prompt diagnosis and management

CONTENT ORGANIZATION

The cases will be presented in quiz format.

- 1) Introduction of Acute Aortic Disease (i.e clinical manifestation, incidence)
- 2) Aortic Dissection
 - a) Classification (DeBakey and Stanford)
 - b) Imaging Features (i.e. Noncontrast CT, Contrast enhanced CT, MR, angiogram) with examples
 - c) Management
- 2) Intramural Hematoma
 - a) Definition/Classification
 - b) Imaging Features and examples
 - c) Management
- 3) Penetrating Atherosclerotic Ulcer
 - a) Definition
 - b) Imaging Features and examples
 - c) Management
- 4) Rupture of Aortic Aneurysm
 - a) Imaging Features and examples
 - b) Management
- 5) Traumatic Rupture of the Aorta
 - a) Imaging Features and examples
 - b) Management
- 6) Mimickers of Acute Aortic Disease
 - a) Case Examples

SUMMARY

It is essential to differentiate the radiologic appearances of these acute aortic disease entities for prompt diagnosis and management.

MDCT Findings of Active Abdominal Hemorrhage

[Back to Top](#)**LL-ERE2610**

Jorge Brito, MD
Claudia Tentugal, MD
Luis Curvo-Semedo, MD, PhD

PURPOSE/AIM

The purpose of this exhibit is: 1. To review optimal MDCT protocol that allows detection and characterization of active abdominal hemorrhage; 2. To describe MDCT features of active bleeding from solid organs, hollow viscus, major vessels and abdominal wall; 3. To recognize predisposing bleeding conditions, in the traumatic and non-traumatic scenarios.

CONTENT ORGANIZATION

Content organization: 1) MDCT study protocol. 2) Overview of abdominal vasculature anatomy. A comprehensive approach will be addressed, in order to understand intraperitoneal and extraperitoneal bleeding. 3) MDCT findings of active abdominal hemorrhage will be displayed, with selected cases of bleeding from mesenteric and major vessels, solid organs, hollow viscus and abdominal wall. In each one MDCT findings of active hemorrhage and the underlying bleeding mechanisms will be emphasized. 4) Conclusions.

SUMMARY

Major teaching points: 1. Abdominal hemorrhage, either spontaneous or as a result of underlying predisposing conditions, is a life-threatening event and should be correctly and immediately recognized. 2. Optimized protocol makes MDCT able to accurately detect and characterize the bleeding site, allowing a prompt referral to treatment options.

LL-ERE2611

Teresa Liang , MD, BSc
Jun Wang , BSc
Sarah A Barrett , MBChB
Savvas Nicolaou , MD

PURPOSE/AIM

1. Review the variety of pathophysiology causing patients to present with acute left lower quadrant (LLQ) pain
2. Discuss the imaging modalities and imaging characteristics used in diagnosis of LLQ pain

CONTENT ORGANIZATION

- Review the anatomy and the different causes resulting in patients presenting with acute LLQ pain
- Review the imaging modalities, such as radiographs, U/S, CT, and MRI, used for assessment of acute LLQ pain for different patient populations including children, pregnant women and the general adult patient
- Demonstrate imaging examples of different causes of LLQ pain including ischemic bowel, sigmoid diverticulitis, ureterolithiasis, ectopic pregnancy, endometriosis, ovarian torsion, aortitis/vasculitis, aortic dissection/aneurysm, and psoas abscess
- Discuss imaging-based management algorithms and the ACR appropriateness criteria
- Discuss new imaging techniques applicable for imaging of patients with LLQ pain including new dose-reduction techniques such as iterative reconstruction, automated kVp modulation, and Dual Energy CT

SUMMARY

Acute LLQ pain can be caused by a diverse variety of pathologies and it is important to recognize the key findings. The imaging approach is significantly different in a pediatric or pregnant women, thus, it is important to recognize which imaging modality is most appropriate.

Patterns and Pathology of Referred Abdomen Pain**LL-ERE2612**

Andrew J Del Gaizo , MD

PURPOSE/AIM

To define referred abdominal pain (RAP) and the hypotheses as to why it occurs To review pathologic conditions that may lead to referred pain either to or from the abdomen To demonstrate the patterns and pathways of RAP through computed tomography cases and accompanying illustrations

CONTENT ORGANIZATION**Background Information****-Definition**

- Hypotheses as to why RAP occurs
- Referred somatic pain
- Referred visceral pain Referred pain TO the abdomen
- Pericarditis with LUQ pain
- Pneumonia with RUQ pain
- Pulmonary Embolism with RUQ pain
- Vertebral osteomyelitis/discitis with epigastric pain Referred pain OVER the abdomen (abdominal wall dermatomes)
- Gastritis with epigastric pain
- Early appendicitis with paraumbilical pain Referred pain FROM the abdomen
- Acute cholecystitis with right scapular pain
- Splenic rupture with left supraclavicular pain (Kehr sign)
- Pancreatitis with back pain
- Duodenal perforation with labial pain (retroperitoneal inflammation irritating the genitofemoral nerve)
- Ureteral stone with scrotal pain
- Obturator hernia with pain along the medial thigh and knee (Howship-Romberg sign)

SUMMARY

When extra-abdominal, RAP often leads to a confusing clinical presentation. Knowledge of the visceral and somatic sensory nerve pathways improves pathology detection and radiologic-clinical correlation.

Trauma of the Wrist and Forearm: Utilizing Demographics, Mechanism of Injury and Injury Patterns to Optimize Diagnostic Accuracy**LL-ERE2613**

Jon Paul Nielsen , MD, MPH
Steven J Baccei , MD
Hartley M Sirkis , MD
Christopher A Cerniglia , DO, MEng

PURPOSE/AIM

Utilize case examples to illustrate how incorporating patient age, mechanism of injury and knowledge of common injury patterns can improve diagnostic accuracy when imaging the patient with a history of wrist and forearm trauma.

CONTENT ORGANIZATION

Common injuries of the wrist and forearm do not occur randomly, but are the result of a combination of the age and bone maturity of the patient, the specific mechanisms which often cause specific patterns of injury. This exhibit will describe ligamentous and fracture patterns resulting from common injuries sustained to the upper extremity. Utilizing radiographic, CT and MRI case examples, the exhibit will be organized as:

1. Anatomy of the wrist and forearm: form and function
2. Relationship of age and fracture types
3. Mechanism and injury patterns
4. Take home points and summary

SUMMARY

The primary teaching points related to imaging wrist and forearm trauma include:

1. The age of the patient, particularly bone maturation, is an important predictor of the type of osseous injury produced.
2. Understanding the zones of susceptibility at the wrist and related injury patterns from lesser and greater arc injuries aides in the detection of ligamentous and osseous injuries.
3. Combining clinical history and mechanism with the patient's age and injury patterns increases the diagnostic accuracy.

When Bamboo Breaks: Acute Trauma and Complications of the Ankylotic Spine**LL-ERE2614**

Glenn A Hoots , MD

PURPOSE/AIM

1. Describe the common features of ankylotic spine diseases and how they predispose to specific injury patterns during trauma
2. Review the most frequent mechanisms of injury in patients with surgically fused or ankylotic spines
3. Illustrate the radiographic, CT and MR findings of osseous and soft tissues injuries seen in ankylotic or fused spine

CONTENT ORGANIZATION

Intervertebral fusion or osseous narrowing of the spinal canal predispose to significant osseous, soft tissue and neurologic injuries in cases with relatively minor trauma. This exhibit will illustrate the spectrum of imaging findings frequently found in the ankylotic or fused spine and how these differ from injuries seen in unaffected spines. Multimodality case examples will include:

- Ankylosing spondylitis
- DISH
- Degenerative spondylosis
- Ossification of the posterior longitudinal ligament
- Surgically fused spine

SUMMARY

Understanding the common features of the fused or ankylotic spine and how it predisposes to certain traumatic injuries can aide the radiologist in the emergency setting. Since injuries can result from relatively minor trauma, it is important for the interpreting radiologist to be aware of the underlying spine disorders in which these injuries can present and understand the common injury patterns which may result.

CT Data Assessment in Polytrauma Patients with the 'Syngo.CT-Bone-Reading' Client

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LL-ERE2615

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PURPOSE/AIM

The „syngo.CT-Bone-Reading“ client is a software tool implemented in the „syngo.via VA 20“ (Siemens, Erlangen, Germany), which enables an automatic 3D-rendering of whole body CT data-sets including an unfolded display of the rib cage and the spine and automated rib and spine labelling. The aim of this presentation is to demonstrate the possible advantages and disadvantages of this application in the evaluation of polytrauma patients.

CONTENT ORGANIZATION

1. Information regarding optimal data acquisition and reconstruction for optimal utilization of the application.
2. Presentation of typical hanging protocols for time-saving evaluation of the rib cage and the spine.
3. Discussion of possible advantages and disadvantages of the „syngo.via-Bone-Reading“ client in the evaluation of a severely injured trauma patient.

SUMMARY

The „syngo.CT-Bone-Reading“ client allows a time-saving evaluation of the whole rib cage and the spine. However, for optimal utilization of this tool certain requirements regarding data acquisition, data reconstruction and work-flow have to be considered. If these are met, it may be possible to reduce reading time and the number of missed findings of rib and spine injuries in polytrauma patients.

Neurological Emergencies in Pregnancy: Overview and Imaging

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LL-ERE2616

Kristina E Hoque , MD, PhD
Ashley E Prosper , MD
Sravanthi Reddy , MD
John L Go , MD
Daphne K Walker , MD

PURPOSE/AIM

1. Review of neurological emergencies in the gravid and postpartum patient and the physiologic changes affecting these conditions
2. Discuss approach to maternal imaging limiting risk to developing fetus
3. Discuss imaging, clinical findings and differential diagnosis with cases review

CONTENT ORGANIZATION

1. Physiologic changes during pregnancy and neurologic pathology
2. Approach to maternal imaging and review of emergent neurologic findings
3. Review of pathology: eclampsia, ischemic stroke, intracerebral and subarachnoid hemorrhage, cerebral venous sinus thrombosis, vasoconstriction (including reversible cerebral vasoconstriction syndrome or postpartum angiopathy), posterior reversible encephalopathy syndrome (PRES), Guillain Barre, choriocarcinoma, amniotic fluid embolism, pituitary apoplexy, TTP, and Wernicke's encephalopathy
4. Discuss differential diagnosis relative to stage of gestation

SUMMARY

Neurological emergencies of pregnancy necessitate immediate diagnosis and treatment. Imaging features and clinical history are key to establishing the correct diagnosis. The goals are: 1. Increase awareness of potential neurologic emergencies in pregnancy 2. Discuss an approach to maternal imaging and review clinical and imaging findings 3. Review differential diagnosis of emergent neuropathology throughout gestation and postpartum period

Thoracolumbar Spine Trauma Classifications: Evolution or More Confusion?

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LL-ERE2617

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Laura Frasccheri , MD

PURPOSE/AIM

To illustrate the variety of traumatic thoracolumbar spine injuries. To review and to compare features, advantages and disadvantages of the main classification systems of thoracolumbar trauma.

CONTENT ORGANIZATION

We will describe the most widely used thoracolumbar spine trauma classification systems, so that radiologist can rapidly identify and use them adapting it to the classification system used by his team. We will compare their advantages and disadvantages Anatomy Description of thoracolumbar spine trauma classification systems Review of imaging findings in MDCT and MRI Sample cases following Denis, AO/Magerl and TLICS, including Kulkarni's spinal cord MRI classification

SUMMARY

Several classifications have been developed based on morphology, injury mechanism, spinal stability and risk of neurological lesion. Some are complex, inaccurate, not predictive or not validated. This has led to confusion among residents and radiologists creating lack of consensus between them, clinicians and surgeons. Spine trauma is a catastrophic event that causes high morbidity and mortality among young and elder population, in addition to the high financial and social cost for families and society. Therefore, excluding, assessing and classifying thoracolumbar injuries are important roles of radiologists working in hospitals and emergency services.

Pitfalls in Emergent Scrotal Ultrasound: A Resident's Guide

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LL-ERE2618

Andres R Ayoob , MD
Jonathan D Walter , BS
David J Nickels , MD
Dennis R Williams , MD
James T Lee , MD

PURPOSE/AIM

The purpose of this exhibit is to highlight potential pitfalls encountered by the on-call radiology resident in the sonographic assessment of acute scrotal pain in the emergency department .

CONTENT ORGANIZATION

Still and cine sonographic images will be provided along with medical illustrations intended to complement sonographic findings. Cases will be presented in quiz format with an emphasis on problem solving techniques designed to aid the radiology resident in avoidance of the following pitfalls:

- Failure to appreciate testicular torsion presenting with subtle asymmetric blood flow
- Unfamiliarity with the diagnosis and imaging findings of testicular appendage torsion
- Failure to detect focal epididymitis
- Mistaking a testicular neoplasm for hematoma
- Mistaking a testicular neoplasm for orchitis

SUMMARY

The major teaching points of this exhibit are: 1. While sonographic findings in patients with acute scrotal pain may be straightforward, it is important to be aware of potential pitfalls in image interpretation. 2. Failure to recognize these pitfalls may lead to incorrect diagnosis, inappropriate treatment or follow-up, and/or unnecessary additional imaging.

Acute Shoulder Trauma: What the Surgeon Really Wants to Know

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LL-ERE2620

Claire K Sandstrom , MD
Stephen A Kennedy , MD,FRCPC
Joel A Gross , MD, MS

PURPOSE/AIM

- Review differentiating imaging features that are important to orthopedic surgeons when making treatment decisions regarding acute traumatic injuries of the shoulder.

CONTENT ORGANIZATION

We will explore fractures of the proximal humerus, scapula, and clavicle, disruptions of the glenohumeral and acromioclavicular joints, and scapulothoracic dissociation. For each injury, relevant anatomy, imaging findings, classification systems (when appropriate) or key injury descriptors, and potential mimics will be described. When applicable, we will explain why some classification systems or injury descriptors are not helpful to the surgeon and can be avoided. Recommendations for additional imaging, if appropriate, will also be reviewed.

SUMMARY

The major teaching points of this exhibit are:

1. Identify the critical findings to review and describe in the radiology report, to assist in appropriate treatment of the patient following trauma.
2. Identify findings and classifications that are not of great utility or important in the care of the patient, so that unnecessary effort is not expended learning these details and reporting them.

Scary Gas, Funny Gas, and the Air In-between: The Spectrum of Soft Tissue Gas Encountered in the Axial Body

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LL-ERE2621

Claire K Sandstrom , MD
Ken F Linnau , MD,MS

PURPOSE/AIM

1. Using imaging examples primarily from radiography and CT, describe soft tissue gas that may be encountered in emergency imaging of the head, neck, torso, and spine.
2. Enable radiologists to differentiate soft tissue gas that is benign, though perhaps a marker of injury or pathology, from gas that represents a surgical or medical emergency.

CONTENT ORGANIZATION

Images that demonstrate abnormal gas in the torso, neck, head, and spine will be shown, organized by body region (retroperitoneal, mediastinal, etc.) and location (intravascular, subcutaneous, intraosseous, etc.). Pathways for gas dissection will be reviewed and accompanied by discussion of the underlying pathophysiology, potential differential diagnoses, and differentiating features. Some examples include: necrotizing soft tissue infection, penetrating trauma, Macklin effect and barotrauma, intravascular gas embolism, Kümmel disease, and vacuum phenomenon.

SUMMARY

1. Ectopic gas within the soft tissues of the torso, neck, and head may be due to emergent or benign causes in the emergency setting.
2. Various clinical and imaging features help differentiate emergent from benign conditions and appropriately triage the patient.

Common Abdominal Emergencies: Can They Be Accurately Diagnosed on Noncontrast CT?

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LL-ERE2622

Andrew Gore , MD

Sean O'Neill , MD
Ravi Dalal , MD
Anthony M Durso , MD

PURPOSE/AIM

In the emergent setting, many CT examinations of the abdomen and pelvis are performed without the administration of intravenous or enteric contrast material. This may be for a variety of reasons, including chronic kidney disease, established contrast allergy, or clinical suspicion for a condition such as urolithiasis which can occasionally be obscured by excreted contrast. However, many of the common abdominal and pelvic emergencies which radiologists are most accustomed to diagnosing on contrast-enhanced examinations can be identified on noncontrast studies. We will provide a refresher for the important noncontrast CT findings in common abdominal emergencies.

CONTENT ORGANIZATION

Selected CT cases from Jackson Memorial Hospital will be used to emphasize the important noncontrast imaging findings in the following conditions, among others:

- 1) Aortic dissection
- 2) Pyelonephritis
- 3) Ovarian torsion
- 4) Diverticulitis
- 5) Appendicitis
- 6) Bowel obstruction

SUMMARY

Despite the absence of intravenous and/or enteric contrast, common abdominal emergencies can still be recognized on CT examinations with appropriate attention to detail, secondary signs and correlation with clinical symptomatology.

Systemic Evaluation of the Pediatric and Adult Traumatic CT Cervical Spine: Pitfalls, Normal Variants, and Pseudolesions

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LL-ERE2623

Hesham Attaya , MD
Craig A White , MD
Robert B Fails , MD

PURPOSE/AIM

Emergent evaluation of the traumatic CT cervical spine is increasingly indicated as a first step imaging modality in the traumatic patient. Positive findings commonly change patient outcome and management. Our goal is to help educate the radiologists in understanding common pitfalls and normal anatomic variants that may lead to false-positives.

CONTENT ORGANIZATION

1. Review of normal embryology and anatomy
2. Systemic approach to evaluation of the traumatic CT C-Spine
3. Review of mechanisms of common fractures and dislocations
4. Review of cervical ligaments and signs of injury
5. Common congenital variants, vascular grooves, synchondroses that may lead to false positives
6. Evaluation of the soft tissues and the surrounding organs

SUMMARY

Careful evaluation of the traumatic C-spine is imperative for correct patient management. Preparing the radiologist with multiple examples of real fractures and dislocations and contrasting normal variants will help increase the confidence of the radiologist on making important daily decisions.

Trauma Sonography: What Radiologists Should Know

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LL-ERE2624

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Sirote Wongwaisayawan , MD
Ruedeekorn Suwannanon
Thidathit Prachanukool
Pungkava Sricharoen
Nitima Saksobhavit , MD

PURPOSE/AIM

The exhibit is directed toward radiology residents and practicing radiologists. The purpose of this exhibit is to: 1. Review sonographic techniques for torso trauma 2. Illustrate the spectrum of imaging abnormalities of trauma with sonography and radiographic/MDCT correlation 3. Illustrate sonographic pitfalls 4. Review literature and current recommendations

CONTENT ORGANIZATION

1. Sonographic techniques for trauma patients 2. Spectrum of abnormalities of multiple trauma on sonography with radiographic/MDCT correlation. Hemoperitoneum and its mimics, abdominal organ injuries (liver, spleen, kidney, bowel and mesentery), pneumoperitoneum, thoracic injuries (pneumothorax, hemothorax, lung injuries, hemopericardium, sternal fracture, clavicle fracture, rib fracture, sternoclavicular dislocation) and volume assessment by inferior vena cava ultrasound will be shown 3. Common sonographic pitfalls. 4. Literature/recommendation review and update

SUMMARY

Sonography is a useful imaging tool for assessment of a variety of pathologies associated with trauma.

Acute Nontraumatic Abdominal Pain in Adults: Sonographic Diagnosis and Pitfalls with Multiplanar CT Correlation (Genitourinary, Vascular and Miscellaneous Pathologies)

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LL-ERE2625

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Orachart M Udompanich , MD

PURPOSE/AIM

The exhibit is directed toward radiology residents and practicing radiologists. Focusing on acute genitourinary (GU), vascular and miscellaneous acute abdominal pathologies, the purpose of this exhibit is to: 1. Review sonographic techniques 2. Illustrate the spectrum of sonographic abnormalities with multiplanar CT correlation 3. Discuss and illustrate sonographic pitfalls related to diagnosis of GU, vascular and miscellaneous acute abdominal emergencies

CONTENT ORGANIZATION

1. Sonographic techniques 2. Review of sonographic findings, sample cases, mimic and pitfalls along with multi planar CT correlation - Testicular torsion, epididymoorchitis, vasitis, scrotal abscess, Fournier's gangrene, obstructing ureteric stone, pyelonephritis, emphysematous pyelonephritis, renal abscess, pyonephrosis, psoas abscess, renal/perirenal hemorrhage, bladder outlet obstruction,

cystitis - Ectopic pregnancy, pelvic inflammatory disease/tuboovarian abscess, ovarian torsion - Abdominal aortic dissection, ruptured abdominal aortic aneurysm, acute mesenteric ischemia - Abdominal wall hematoma, obstructed hernia 3. Summary
SUMMARY

Sonography is a useful tool for diagnosing a variety of acute genitourinary, vascular and miscellaneous abdominal pathologies.

Acute Nontraumatic Abdominal Pain in Adults: Sonographic Diagnosis and Pitfalls with Multiplanar CT Correlation (Gastrointestinal and Hepatobiliary-pancreatic Pathologies)

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LL-ERE2626

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Orachart M Udompanich, MD

PURPOSE/AIM

The exhibit is directed toward radiology residents and practicing radiologists. Focusing on acute gastrointestinal (GI) and hepatobiliary-pancreatic (HBP) pathologies, the purpose of this exhibit is to: 1. Review sonographic techniques 2. Illustrate the spectrum of sonographic abnormalities with multiplanar CT correlation 3. Discuss and illustrate sonographic pitfalls related to diagnosis of GI and HBP emergencies

CONTENT ORGANIZATION

1. Sonographic techniques 2. Review of sonographic findings, sample cases, mimics and pitfalls along with multiplanar CT correlation - Complex free fluid/air - Bowel obstruction, appendicitis, cecal and sigmoid diverticulitis, small bowel diverticulitis, epiploic appendagitis, omental infarction, enteritis, small bowel hemorrhage, colitis, intussusception, neutropenic colitis, tuberculous ileitis, ruptured gastrointestinal tumor, gossypiboma - cholecystitis, emphysematous cholecystitis, gallbladder empyema, pancreatitis, hepatic abscess, hepatitis, Budd-Chiari syndrome, ruptured liver tumor, Dengue hemorrhagic fever, splenic infarction 3. Summary

SUMMARY

Sonography is a useful tool for diagnosing a variety of acute gastrointestinal and hepatobiliary-pancreatic pathologies.

Role of MR Imaging in the Clinical Management of Traumatic Cervical Spine Fractures

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LL-ERE2627

Pranav Chitkara, MD
Raja Anne, MD
Scott A Lehto, MD
Srinivas Kolla, MD
Steven Pulitzer, MD

PURPOSE/AIM

1. Explain which cervical injuries and clinical situations require further evaluation with magnetic resonance imaging.
2. Review the pathophysiology and classic imaging findings of these traumatic cervical spine injuries.
3. Demonstrate the salient MR imaging findings for these fracture types that are important to specialists in determining management

CONTENT ORGANIZATION

1. Pathophysiology and classic CT and/or plain radiography imaging findings of common traumatic cervical spine injuries:

- Flexion injuries (jumped facet, wedge, and flexion teardrop fractures)
- Axial compression injuries (Jefferson and lower cervical spine burst fractures)
- Extension injuries (Hangman, extension teardrop, odontoid (type II) fractures)

2. Outline which cervical spine injuries require further evaluation with MR

- Clinical and special situations, including neurological deficit and persistent pain in the setting of normal CT

3. Demonstrate critical MR imaging findings relative to normal MR anatomy.

SUMMARY

- Learn the significance of magnetic resonance imaging in clinical management to identify signs of osseous, ligamentous and neurological pathology.
- Become familiar with critical injuries on MR in comparison with normal MR anatomy.
- Develop a systematic approach to evaluate when further MR imaging is necessary in the acute/subacute setting.

Sudden Visual Loss with Normal Eye Fundus: A Challenge for the Emergency Neuroradiologist

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LL-ERE2628

Paloma Puyaito, MD
Juan Jose Sanchez, MD, PhD
Silvia Munoz
Natalia Vila
Carles Aguilera
Jorge Arruga
Monica Cos
Albert Pons Escoda

PURPOSE/AIM

The purposes of this exhibit are to: 1. Describe the spectrum of non ocular causes of sudden visual loss in the Emergency Department. 2. Discuss the role of MRI in the diagnosis of uni or bilateral sudden visual loss. 3. Give the clues for achieving a short differential diagnosis and a correct final diagnosis.

CONTENT ORGANIZATION

Diagnosis and management of acute visual loss at the Emergency is a challenging issue, especially when, in the eyes examination, the ocular aetiology, such as retinal detachment or vascular occlusion, is ruled out. In these scenarios, MRI should be performed in order to exclude: ischemic pathology (acute posterior circulation infarction), demyelinating (multiple sclerosis or optic neuromyelitis), visual pathway extrinsic compression (primary tumors, metastases, pituitary or tumor apoplexy, fibrous dysplasia of the skull base or compressive aneurisms), inflammatory conditions (tuberculosis or sarcoidosis), posterior reversible encephalopathy syndrome or iatrogenic causes such as acute optic neuropathy due to radiotherapy

SUMMARY

Although neuro-ophthalmologic approach with fundus eye examination is the first step in acute unexplained visual loss, neuroimaging should be immediately after performed in order to achieve an accurate diagnosis that allow a prompt and specific treatment, which may reduce these patients morbidity significantly

Operative Management of the Flail Chest Wall: Who, How, and Radiographic Findings

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LL-ERE2629

Michael C Gates, MD

Richard Miller , MS
Abbie C Kemper , MD, PhD
Alberto A Simoncini , MD
Richard Wigle , MD
Maureen G Heldmann , MD

PURPOSE/AIM

Review the physiologic implications and radiographic diagnosis of flail chest
Relate the accumulating surgical literature relative to the benefits of operative rib fixation
Illustrate surgical fixation of complex chest wall injuries, with pre-, intra- and post- operative correlates
Depict expected and unexpected radiographic findings post chest wall fixation

CONTENT ORGANIZATION

Flail chest: clinical/radiographic/physiologic impact
Selection criteria for operative stabilization
Procedural description with operative photographs
Pre- and post- operative radiographic assessment

SUMMARY

Operative therapy for flail chest post-trauma appears to be growing in advocates, and should therefore expose general radiologic health professionals to the appearance of chest wall fixation, whether for symptoms related to thoracic trauma or incidentally. Fundamental concepts reviewed here will aid the general diagnostician in identification of typical devices and context that will promote a careful search for imaging evidence of complication.

Biphasic Contrast-enhanced Whole-body MDCT Protocols in Polytrauma; Evolution of Technique, Interpretation and Pitfalls

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LL-ERE2630

Katharine Augustine , MBBS, FRCR
Shalini M Wijesuriya , MBBS, FRCR
David W Wilson , MBBChir, FRCR

PURPOSE/AIM

1. To review the development, indications and utility of biphasic MDCT protocols in the polytrauma setting. 2. To consider risks and benefits to the patient in selection of technique 3. To demonstrate imaging appearances of visceral and vascular injury, pitfalls and artefacts of this technique to aid the radiologist in interpretation

CONTENT ORGANIZATION

1. Evolution of new CT imaging techniques in Polytrauma - MDCT - Biphasic protocols - Multiplanar reformatting and 3D reconstruction 2. Review of indications -Trauma Scores 3. Risks and benefits -Radiation dose -Time -Accuracy 4. Image Interpretation of Biphasic Trauma CT scans - Case examples of appearances of visceral and vascular injuries - Mimics, pitfalls and artefacts - patient, operator and interpretation factors

SUMMARY

1. Biphasic MDCT technique in polytrauma results in rapid acquisition and a large volume of imaging information enabling timely diagnosis of life-threatening injury. 2. It is not always appropriate. Individual cases should be considered after reviewing risks and benefits. 3. Familiarisation with normal visceral appearances and artefacts using this technique helps avoid interpretation pitfalls in acute traumatic injury.

Evaluation of Infectious and Non-infectious Emphysematous Lesions in the Abdominal Cavity

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LL-ERE2631

Juan P Salazar , MD, MSc
Juan Halaburda Berni
Adriana C Montealegre Angarita
Sergi Quiroga
Julio Gaete
Maria Pardo-Antunez
Maria Simonet

PURPOSE/AIM

The purpose of this exhibit is: - To describe and illustrate the clinical characteristics and imaging findings in MDCT of abdominal infectious emphysematous lesions. - To discuss and display the infectious and non-infectious differential diagnosis in cases of either intramural or parenchymatous extraluminal gas.

CONTENT ORGANIZATION

We illustrate cases of emphysematous gastritis, emphysematous pancreatitis, emphysematous cholecystitis, emphysematous pyelonephritis, necrotizing fasciitis (Fournier's gangrene). Amongst non-infectious causes we include endovascular and endoscopic procedures, toxic poisoning, hematoma, trauma, bowel obstruction, ischemia and thrombosis.

SUMMARY

Though emphysematous infections of the abdominal cavity are rare, they require an early radiological diagnosis and proper treatment. Radiologists should be familiar with the imaging findings of each of these entities, as well as the differential non-infectious emphysematous causes.

Hepatic Pains: Imaging of Hepatocellular Carcinoma Presenting to the Emergency Room

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LL-ERE2632

Shaile Phillips , MD
Seng Thipphavong , MD
Abhijit Sunnapwar , MD
Christine O Menias , MD

PURPOSE/AIM

1. To discuss the complications that arise in hepatocellular cancers that lead to acute presentation with abdominal pain. 2. Discuss imaging findings of these complicated HCC and implications on management

CONTENT ORGANIZATION

This review is in a case review/quiz format Undiagnosed,untreated and previously treated hepatocellular carcinomas (HCC) that present with acute symptoms are demonstrated and discussed Multimodality (US, CT and MRI) imaging of causes of sudden and emergent HCC complications, including: hemoperitoneum, IVC thrombus, hepatic infarct/necrosis, post RFA abscess, post TACE hepatic rupture

SUMMARY

Emergent presentation of HCC to the emergency room although infrequent demonstrates a high morbidity/mortality An imaging diagnosis is crucial for diagnosis of these acute complication and in some case, identifying the underlying tumor itself. Radiologists need to be aware of these complications and their imaging findings for an accurate diagnosis.

Case Based Approach to Dose Reduction in the Emergency Department

LL-ERE2633

Jun Wang , BSc
Teresa Liang , MD, BSc
Hee-Jun Kang
George Papachristopoulos , MD
Savvas Nicolaou , MD

PURPOSE/AIM

1. Review the risk of ionizing radiation due to increased use of CT in the Emergency Department (ED) 2. Discuss current and future dose reduction strategies for use by radiologists in the ED 3. Use a case-based approach to illustrate specific examples of common clinical scenarios where dose reduction plays a significant role

CONTENT ORGANIZATION

*Summarize the current understanding of radiation risk to patients undergoing medical imaging *Discuss CT parameters that affect radiation dose and methods of monitoring dose exposure to patients *Review dose reduction strategies, including tube current and potential modulation, adaptive collimation, iterative reconstruction and virtual non-contrast scans using dual-energy CT *Demonstrate key radiological findings and examples of dose reduction techniques in commonly encountered scenarios in the ED *Evaluate the role of non-ionizing imaging, such as ultrasound (U/S) and MRI, in the ED setting

SUMMARY

1. Imaging of patients presenting to the ED has greatly increased, leading to concerns of radiation exposure 2. Under the ALARA principle, dose reduction techniques should continue to be optimized to reduce radiation dose and patient risk 3. Dose reduction can be employed by Emergency Departments using techniques before the scan, during the scan and after the scan

Thoracolumbar Injury Classification and Severity Score (TLICS): Introduction to a New Classification of Thoracolumbar Spine Injuries

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Nicholas M Beckmann , MD
Susanna C Spence , MD
Manickam Kumaravel , MD, FRCR

PURPOSE/AIM

The purpose of this exhibit is to: 1. Review the current classification systems for thoracolumbar spine injuries 2. Introduce the new TLICS system of classifying thoracolumbar spine injuries 3. Discuss advantages/disadvantages of new TLICS system compared to current classifications

CONTENT ORGANIZATION

Review of Thoracolumbar Spine Anatomy Current Classifications of Thoracolumbar Spine Injury TLICS Classification of Thoracolumbar Spine Injury Three components of TLICS classification 1. *Injury morphology*: compression, distraction, translation/rotation 2. *Integrity of the posterior ligamentous complex* 3. *Neurological status*: intact vs. root injury vs. cord injury **Discuss point system used with TLICS system for determining operative vs. non-operative patients** Examples of applying TLICS classification to thoracolumbar spine injuries **Review Advantages/Disadvantages of new TLICS System**

SUMMARY

The main teaching points of this exhibit are: 1. Introduce a new classification system for thoracolumbar spine injuries 2. Educate viewers on proper implementation of this classification system 3. Demonstrate how this new system can be used to help determine operative vs. non-operative thoracolumbar spine injuries

Vascular Conditions Presenting as Acute Abdomen - Imaging Review with Management Options

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Jignesh N Shah , MD
Alampady K Shanbhogue , MD
Shuaib Waqas
Kiran K Maddu , MBBS
Faisal Khosa , FFRRCSI, FRCPC

PURPOSE/AIM

- Review and illustrate the imaging findings of a wide spectrum of vascular pathology, presenting as acute abdomen
- Discuss the management options in the acute setting

CONTENT ORGANIZATION

Normal vascular anatomy of abdomen; List of various vascular etiologies of acute abdominal pain including but not limited to Abdominal vascular thrombosis (Aortic, Celiac, Mesenteric, Renal artery and vein thrombosis), Symptomatic Abdominal vascular aneurysms (Abdominal aortic, splenic, hepatic and renal artery aneurysms), Acute Aortic syndromes (dissection, intramural hematoma and penetrating ulcer Syndromes such as nutcracker syndrome, superior mesenteric artery syndrome, median arcuate ligament syndrome; Management options in the acute setting

SUMMARY

A wide spectrum of vascular pathology presents as acute abdomen. Familiarity with the spectrum of imaging findings of these conditions will enable the radiologist to make a prompt diagnosis and facilitate appropriate management by the referring clinician.

Seeing Beyond Decreased Bowel Enhancement: Acute Abnormalities of the Mesenteric and Portal Vasculature

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Claire K Sandstrom , MD
Christopher R Ingraham , MD
Guy E Johnson , MD

PURPOSE/AIM

- Review imaging findings on CT and angiography of typical and unusual acute pathologies affecting the mesenteric and portal vasculature

CONTENT ORGANIZATION

Focusing on imaging appearance, acute complications, and typical management, content will be organized according to vessel of involvement and underlying pathophysiology: 1. Occlusive mesenteric ischemia

- Mesenteric artery embolism
 - Mesenteric artery thrombosis
 - Mesenteric artery obstruction from volvulus
 - Mesenteric artery dissection
2. Nonocclusive mesenteric ischemia
 3. Portomesenteric vein thrombosis
 4. Local disease (pancreatitis, diverticulitis, trauma, etc.)
 • Systemic hypercoagulable state (acquired or inherited)
 4. Post-traumatic mesenteric hematoma

SUMMARY

The major teaching points of this exhibit are:

1. While uncommon, acute mesenteric ischemia is a potentially life-threatening condition that requires prompt imaging diagnosis and treatment. Because clinical and laboratory findings are nonspecific, the Radiologist plays a crucial role in initial evaluation of mesenteric ischemia.
2. For some cases, endovascular therapy may be an alternative to open surgical intervention.

Tubes and Lines - What's What and Where's Where

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LL-ERE2637

Joel A Gross , MD, MS
Yulia Ivashkov , MD
J. D Godwin , MD
Martin L Gunn , MBChB *

PURPOSE/AIM

Demonstrate the appearances of commonly used tubes and lines, less common variants that can result in misdiagnosis, and provide pearls to ensure correct tube and line positioning.

CONTENT ORGANIZATION

A variety of tubes and lines are placed into ill patients, including endotracheal tubes, tracheostomy tubes, nasogastric tubes, gastric tubes, feeding tubes, temperature and pH probes, central lines, bladder catheters, and rectal tubes. Using illustrations of these tubes, radiographs of the tubes, and in-situ images, this exhibit demonstrates the typical appearance of tubes and lines. Content is organized by tube type. For each type of tube, the normal appearance and position are summarized. Pitfalls that could lead to misinterpretation are provided, along with "tips" to ensure correct tube identification and positioning. Pitfalls include less familiar variants that can result in errors in interpretation of their type and location. These include endotracheal tubes with an interruption in their radiopaque markers, that may be mistaken for the end of the tube, and dual lumen endotracheal tubes which may be mistaken for inadvertent bronchial intubation.

SUMMARY

This educational exhibit reviews common and uncommon tubes and lines, and demonstrates techniques to avoid misinterpretation of the device type and location.

'Glow in the Dark!': Hyperdense Thrombus, Clot, and Hematoma on Non-enhanced CT

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LL-ERE2638

Takashi Miyakawa , MD
Junichi Matsumoto , MD
Brandon D Lohman
Fumie Sato , MD
Takafumi Haraguchi , MD
Yasuo Nakajima , MD
Yasuhiko Taira , MD

PURPOSE/AIM

CONTENT ORGANIZATION

1. CT value and hemoglobin 2. How to brighten clot, thrombus, and hematoma on nonenhanced CT image: Narrow window setting is the key. 3. Various clot, thrombus, and hematoma on non-enhanced CT: 1) subtle SAH 2) cerebral venous thrombosis: cord sign 3) cerebral infarction: hyperdense MCA and other sign 4) pulmonary embolism: rarely visible on non-enhanced CT 5) aortic dissection: especially in the thrombosed type 6) SMA dissection 7) SMA thrombosis 8) bowel strangulation 9) GI bleeding 10) trauma: Sentinel clot sign 11) others 4. Pitfalls 1) anemia 2) hemoconcentration 3) contrast material and other materials

SUMMARY

Major teaching points of this exhibit is to 1) Clot, thrombus, and hematoma are important key findings for ischemic and hemorrhagic diseases. 2) Look for them when you look at non-enhanced CT images. 2) When you look for them adequate narrow window setting is the key; they glow in the dark!

False Alarm--A Primer on Differentiating Trauma from Mimics for the On-call Radiologist

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LL-ERE2639

Sofiya Greenberg , MD
Kory Byrns , MD
Judy Atallah , DO
John H Krumenacker , MD
Steven Lev , MD

PURPOSE/AIM

To help the on-call resident differentiate between CT mimics and acute trauma, illustrating cases from our Level I trauma center

CONTENT ORGANIZATION

In the trauma setting, normal structures, motion and artifacts may be overdiagnosed as injury. In the head, bony volume averaging, calcifications and a hyperdense tentorium or falx can be mistaken for hemorrhage. Diffuse cerebral edema may show pseudo-subarachnoid hemorrhage. Cranial sutures, synchondroses and vascular channels, such as emissary veins, can appear as fractures. Intracranial pneumocephalus can pinpoint a subtle fracture, however cavernous sinus gas may result from venous air embolus. In the spine, limbic vertebrae, the basivertebral plexus and ossification center non-fusion can also mimic fractures. In the chest, we show a pneumothorax look-alike formed from a contrast containing vein. Pulsation artifact, a thickened aortic valve, a misshapen ductus remnant and lower lobe atelectasis can all resemble acute aortic injury. In the abdomen, an enlarged left hepatic lobe, a prominent diaphragmatic crus, and an accessory spleen can mimic hemorrhage. Heterogeneous enhancement of the liver or spleen can look similar to blunt trauma. Nonopacified bowel loops can appear thickened, a worrisome finding.

SUMMARY

Anatomical variants and artifacts can mimic acute pathology, complicating trauma CT interpretation.

AIDS Patient in the Emergency Room-The Role of a Radiologist

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LL-ERE2640

Sharmila Duraisamy , MBBS, MD
Umesh C Garga , MBBS, MD

PURPOSE/AIM

1) to list the acute presentations of various complications of HIV -AIDS and their varied presentations 2) help the radiologist in identifying the various imaging findings of these acute complications 3) a case based review of the neurological, abdominal and musculoskeletal complication

CONTENT ORGANIZATION

SUMMARY

Acute complications in an AIDS patient may be due to the progression of the disease or as a side effect of the drug used in treatment As

these patients are immunocompromised the common conditions may have an atypical presentations. The radiologist play a crucial role in the diagnosis of these complications and aid in either medical or surgical management.

Emergency Radiology (Imaging Chest Emergencies)

Sunday, 10:45 AM - 12:15 PM • N228

ER CT VA CH

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SSA05 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Sanjeev Bhalla, MD

Moderator

Michael N Patlas, MD

SSA05-01 • Detection of Intramural Hematoma: Is a Non-contrast Phase Really Necessary?

Christopher A Potter MD (Presenter) ; Daniel S Hippe MS * ; Elan D Bomsztyk MD ; Guy E Johnson MD ; Bruce E Lehnert MD ; Lorenzo Mannelli MD, PhD ; Claire K Sandstrom MD ; Martin L Gunn MBChB *

PURPOSE

CT angiography is sensitive and specific for diagnosis of intramural hematoma (IMH), aortic dissection (AD) and penetrating atherosclerotic ulcer (PAU). Most acute aortic syndrome (AAS) protocols use a pre-contrast phase to detect IMH, as contrast-enhanced phase alone is believed insufficiently sensitive for IMH, but there is little supporting data.

METHOD AND MATERIALS

We retrospectively reviewed images of patients who presented to our Emergency Department with suspected AAS and received pre- and post-contrast CTA from 2/1/2005 to 2/1/2010 for isolated acute IMH, defined as IMH without visible intimal flap. 423 studies were reviewed. 11 cases of IMH were identified. 22 normal controls and 12 abnormal controls (AD or PAU) were age and sex matched and added. The 45 studies were randomized. Only contrast-enhanced images were evaluated by three blinded, independent fellowship-trained radiologists. Reviewers rated their confidence for IMH using a 5-point modified Likert scale, also indicating if they recommended a non-contrast study to exclude IMH. Inverse probability weighting was used to extrapolate ordering rates from the matched case-control sample to the original sample.

RESULTS

423 patients underwent CTA for AAS. 11 patients were diagnosed with IMH (incidence of 2.6%). On independent case review, overall rater sensitivity for IMH on contrast-enhanced images alone was 94% (CI 74-99%) and specificity 97% (CI 88-99%). For all false negative cases, confidence rating for exclusion was low and delayed non-contrast examination was recommended. If delayed CT were ordered due to suspicious findings on contrast-enhanced images, 7.1% of patients (CI 3.3-14%) would undergo a delayed CT to exclude IMH. More conservatively, if delayed CT were ordered when confidence rating of 1 or 5 (definitely not present or definitely present) cannot be assigned, only 14% (CI 7.5-25%) of patients would undergo additional delayed CT. While the present sample was not large enough to be definitive, no IMH cases would be missed using this approach.

CONCLUSION

Acute IMH is a very uncommon diagnosis in patients with suspected AAS. A pre-contrast examination is unnecessary for diagnosis of acute IMH. Dose and time savings may be achieved by eliminating the pre-contrast phase.

CLINICAL RELEVANCE/APPLICATION

Exclusion of non-contrast phase on CTA for acute aortic syndrome, used in most ED protocols, may result in overall patient time and radiation dose savings.

SSA05-02 • Is the Precontrast CT Series Necessary for Ruling Out Acute Aortic Intramural Hematoma?

Elie Portnoy MD (Presenter) ; Maria C Shiao MD ; James S Babb PhD ; Rose Weiner BS ; Francis G Girvin MBChB ; Jane P Ko MD ; Derek M Mason MD ; Maj L Wickstrom MD

PURPOSE

To assess the need for pre-contrast imaging when evaluating for Acute Aortic Intramural Hematoma (IMH). The current gold standard for the detection of Aortic Dissection (AD) is CT angiography. However, along the disease spectrum of AD, lie several related pathologies with near identical clinical presentations. IMH, one such disease, lacks an intraluminal flap or discernible communication between the luminal blood and the intramural hematoma. It has long been posited that concern for this pathology alone necessitated pre-contrast images (in addition to post contrast images) to conclusively rule out IMH (in addition to AD.) This study seeks to demonstrate non-inferiority to post-contrast imaging alone in comparison to pre- and post-contrast studies.

METHOD AND MATERIALS

Study group of 23 patients (10M;13F;age 57-93;mean:78.5y) who underwent Pre- and Post-Contrast CT series and were diagnosed with IMH via official radiology report at a tertiary care hospital between 2007 - 2011. 23 gender and age controlled subjects were selected with no remarkable findings on CT. Five independently operating thoracic radiologists (dedicated experience in specialty 5-14 years) were presented with randomized, anonymized post-contrast imaging alone of the 46 above patients, aware of suspected acute aortic injury, and asked to comment on the absence or presence of IMH, AD, and/or penetrating ulceration. They were then presented with both the Pre- and Post-Contrast series for these patients and asked for their diagnoses yet again.

RESULTS

Within the post-contrast group, the readers were diagnostically accurate for IMH 72.8% of the time, as opposed to the combined pre- and post-contrast group, where they were accurate 76.8%. (p-value .340). (95% CI -2.2?8.8.) Since the difference between the 2 groups was statistically insignificant and it can be asserted with 95% confidence that no greater than 8.8% of cases of IMH would be missed with post-contrast imaging alone, post-contrast imaging alone was statistically non-inferior to combined pre- and post-contrast imaging. .

CONCLUSION

IMH is radiographically evident on post contrast imaging alone and it is statistically non-inferior to combined pre- and post-contrast sequences.

CLINICAL RELEVANCE/APPLICATION

In clinical practice, when evaluating for possible aortic syndromes (Dissection, IMH, etc.) we contend that post-contrast angiography alone may suffice. Broader/confirmatory study may be warranted.

SSA05-03 • Reduced Z Axis CTPA in Pregnant Women for Pulmonary Embolism - Do We Really Miss Any Important Diagnoses? How Much Is the Resultant Dose Reduction?

Kaushik S Shahir MD (Presenter) ; Luis A Sosa MD ; Jonathan M McCrea MD ; Lawrence R Goodman MD

PURPOSE

To evaluate the feasibility for applying reduced z axis coverage in CTPA in pregnant women. Were important diagnoses missed? What dose reduction resulted?

METHOD AND MATERIALS

In this IRB-approved retrospective study, 84 pregnant patients underwent CTPA for pulmonary embolism during 2004-2012. New axial, sagittal and coronal series were created with a reduced anatomic coverage extending from aortic arch to the base of the heart. These were read individually by 2 experienced blinded readers on the PACS workstation. The scans were evaluated for PE, incidental and pertinent findings. The readers had access to most recent chest radiograph. These results were compared with original report by the 3rd reader. In case of missed abnormality, 3rd reader checked whether the finding was a known abnormality or whether it influenced the clinical outcome. Additionally, we estimated dose length product (along z axis) for 40 patients as a quality control project.

RESULTS

Two out of 84 patients had PE and were successfully identified by both readers. 32 patients had normal exams. Rest of the patients had 57 pertinent and 20 incidental findings. 4 incidental findings including 3 benign thyroid nodules and one benign splenic calcification were missed. One pertinent but a benign lung nodule was missed, but this was a known abnormality based on prior CT. None of these missed findings affected further clinical outcome or management. Radiation dose was reduced by a mean of 69%.

CONCLUSION

No PE or any important diagnosis are missed using the reduced anatomic coverage CTPA for PE in pregnant women. The radiation dose is reduced by approximately 69%. Hence we highly recommend this technique in pregnant women.

CLINICAL RELEVANCE/APPLICATION

The study helps solve any doubts as regards to using a reduced z-axis CTPA technique for PE in pregnant women.

SSA05-04 • Feasibility Study of Low Dose Chest CT for Initial Evaluation of Blunt Chest Trauma Patients

Jae Yong Cho MD (Presenter) ; Joo Sung Sun MD ; Sung Jung Kim ; Kyu-Sung Kwack MD, PhD ; Sung Hoon Park MD ; Kyung Joo Park MD ; Young Gi Min MD

PURPOSE

To evaluate the feasibility of low dose chest CT (LDCT) for initial evaluation of blunt chest trauma.

METHOD AND MATERIALS

A total of 71 patients who met criteria indicative of major trauma (76% male; age range, 16-85) were included. All patients underwent LDCT without IV contrast and standard CT with IV contrast using parameters as followings: LDCT, 40mAs with ATCM and 100kVp or 120kVp (based on BMI); standard post-contrast CT, 180mAs with ATCM and 120kVp. Transverse, coronal, sagittal images were reconstructed with 3-mm slice thickness without gap. Reference standard images were reconstructed using standard CT data (1-mm slice thickness without gap). Reference standard was established by 2 radiologist by consensus. Four readers independently evaluated chest injury (fractures of bony thoracic cage, aortic injury, tracheobronchial injury, esophageal injury, hemothorax, pneumothorax, pulmonary contusion). Four investigators recorded results with 4 confidence scale (0-3 point). Comparison of radiation dose was done.

RESULTS

Radiation doses (CTDIvol) of LDCT (average 2.67mGy) was significantly lower than those of standard CT (average 13.4mGy)(78% dose reduction). ROC analysis and intraclass correlation coefficient ICC measurement demonstrated that LDCT was comparable to standard dose CT for evaluation of chest injury. ROC comparison analysis revealed no significant difference of diagnostic performance between LDCT and standard dose CT for the diagnosis of bony thoracic cage fracture, pulmonary contusion, hemothorax, pneumothorax, chest wall injury ($p>0.05$). ICC was measured for inter-observer consistency and revealed that there was good inter-observer consistency in each examination of LDCT and standard dose CT for evaluation of chest injury (0.83~0.94). Aortic injury could not be appropriately compared due to LDCT underwent without using contrast materials and this was limitation of this study.

CONCLUSION

Our conclusion is that there is a great potential benefit to use LDCT for initial evaluation of blunt chest trauma because LDCT could maintain diagnostic image quality as standard dose MDCT and provide significant radiation dose reduction. Further study of LDCT with IV contrast for evaluation of aortic injury is needed.

CLINICAL RELEVANCE/APPLICATION

This preliminary study suggest LDCT could be adequate initial imaging modality for blunt chest trauma patients with maintaining diagnostic image quality and reducing radiation dose.

SSA05-05 • Usefulness of Ultra Low-dose (sub mSv) Chest CT Using iDose4 Iterative Reconstruction for Initial Evaluation of Sharp Fish-bone Esophageal Foreign Body

Boram Yi MD (Presenter) ; Joo Sung Sun MD ; Young Gi Min MD ; Kyung Joo Park MD

PURPOSE

To evaluate the usefulness of ultra low dose chest CT (uLDCT) as initial imaging study for sharp fish-bone esophageal foreign body (EFB).

METHOD AND MATERIALS

A total of 38 subjects who visited emergency room with an obvious history and symptoms of sharp fish-bone EFB were included in this study. uLDCT were acquired at 20mAs with ATCM and 100kVp or 120kVp on a 64 MDCT scanner (Based on BMI). All uLDCT data were reconstructed twice, once with FBP and once with iDose4 IR, then 2 sets of CT data were randomly arranged and reviewed by 3 readers who were blinded to the result. Readers independently reviewed 3-mm thickness transverse and coronal images. Readers also scored subjective image quality (4 point scale). One reader measured objective image noise (SD of circular ROI, 10 pixels in diameter at the following level: right common carotid artery of the thoracic inlet; pulmonary trunk; D-aorta of lung base). Positive findings were defined as identification of high-density foreign body, secondary findings (soft tissue swelling, pneumomediastinum). ROC analysis was used to evaluate diagnostic performance of uLDCT. Intraclass correlation coefficient (ICC) was measured for analysis of inter-observer consistency.

RESULTS

Thirty-three fish bone EFBs were identified and removed by 31 esophagogastroscopy, and 2 operations. Among 5 cases of true negative, false positive lesions were frequently recorded as the cervical EFB when reviewing CT data using FBP than CT data using iDose4 IR. uLDCT provided radiation dose reduction by average 0.82 mGy of CTDIvol and 32.7 mGy*cm of DLP (0.46mSv). Significant noise reduction (objective and subjective) of mediastinum was achieved using iDose4 IR technique (p

CONCLUSION

Very low dose CT using iDose4 provided satisfactory diagnostic image quality for identifying fish-bone EFB with reduced radiation dose, therefore uLDCT would be adequate as first imaging modality for sharp fish-bone EFB. iDose4 IR would be useful to reduce image noise of mediastinum mimicking EFB.

CLINICAL RELEVANCE/APPLICATION

Very low dose chest CT using iDose4 IR would be first imaging modality for initial evaluation of sharp fish bone esophageal foreign body before flexible endoscopic removal.

SSA05-06 • Increased Referral-rate for Investigation, and Increased Incidence of Symptomatic Radiologically-diagnosed Pulmonary Embolus in a Large Teaching Hospital, over a 10 Year Period

Kenneth Muir (Presenter) ; Nicholas C Morley MA, FRCR ; Edwin J Van Beek MD, PhD * ; John Murchison MBCHB

PURPOSE

To measure the rate of referral for radiological investigation of suspected acute Pulmonary Embolism (PE) and the incidence of PE

detected in these scans, in a large teaching hospital. To observe changes in these measurements over the recent decade.

METHOD AND MATERIALS

Retrospective review of radiology records for Computed Tomography Pulmonary Angiograms (CTPA) and Perfusion Scans (Q-scans) for suspected acute PE, between 1st April 2002 and 1st April 2012. Graphical and statistical analyses were performed with Microsoft Excel and Graphpad Prism. Some of the data for the earlier years in this study was published previously (O'Neill et al., 2004). Our local research ethics service approved this project.

RESULTS

111% increase in total VTE investigations over 10 years, from 996 to 2111. Substantial increase in referral for CTPA, incrementally from 706 to 2020 scans per year. We also saw a decline in Q-scans from 290 to 91 per year. Increase in total number of PEs diagnosed, with annual incidence rising from 147 (15% positive-scan rate) to 426 (20% positive-scan rate), an increase of 190%. We observed an older population of PE patients, with mean age at diagnosis of PE going up from 62.2 to 65.4 ($p = 0.03$) and a 6-fold increase in PEs diagnosed in the 85-94 age group, from 9 to 57 per year.

CONCLUSION

There has been a major increase in the total number of investigations for suspected acute PE, accounted for by an increased use of CTPA with a corresponding decrease in the use of Q scans. In spite of what is generally assumed, the positive diagnosis rate increased, which may be a reflection of changed patient demographics combined with greater sensitivity of CTPA with newer CT scanners.

CLINICAL RELEVANCE/APPLICATION

The current rate of investigation for suspected acute PE is justified by a high rate of relevant diagnoses. Analysis of PE severity in these cohorts is warranted and is ongoing.

SSA05-07 • Cost and Risk Analysis of CT Pulmonary Angiography to Rule Out Pulmonary Embolism in Low and Very Low Risk Emergency Department Patients

Scott A Atkins MD (Presenter) ; Steven Munson MD ; J. Paul Jacobson MD * ; Thomas J Kelly MD

PURPOSE

A recent study has shown that approximately one third of CT pulmonary angiograms (CTPAs) performed to rule out pulmonary embolism (PE) in the emergency department (ED) are in low risk or very low risk patients based on Wells criteria and D-dimer, resulting in potentially avoidable cost to our healthcare system and risk to patients. The purpose of this study is to evaluate the cost effectiveness of CTPA in diagnosing PE in low risk patients and to quantify potentially avoidable cost and patient risk with the current medical practice pattern. Other studies have been done showing that CTPA is a cost effective method to diagnose PE when used in conjunction with Wells criteria and D-dimer. However, no studies have quantified the additional cost and patient risk when this standard of care is not followed and potentially avoidable imaging is performed.

METHOD AND MATERIALS

A literature search was performed and data on the current use of CTPA in the diagnosis of PE was reviewed. A decision model was constructed for evaluating low and very low risk patients for PE with and without the use of CTPA. The costs and patient utilities for each outcome were plotted to determine the dominant strategy. Strategies are dominant if they have lower costs and better outcomes compared to other strategies based on quality adjusted life years (QALYs). Sensitivity analyses were performed to test the stability of the results over a wide range of clinically relevant values.

RESULTS

The strategy of ED observation, not performing CTPA, dominated the strategy of performing CTPA to rule out PE in low and very low risk ED patients. ED observation dominated over a wide range of clinically relevant values, showing cost savings to the medical system and better patient outcomes when compared to performing CTPA in this population.

CONCLUSION

Ruling out pulmonary embolism in ED patients should begin with an assessment of risk based on clinical factors (Wells criteria) and a D-dimer to ensure that CTPA is not performed on patients who are low or very low risk. The potentially avoidable CTPAs performed on low risk patients add significant cost to the medical system without improving patient care. In fact, potentially avoidable imaging poses significant risk to these patients.

CLINICAL RELEVANCE/APPLICATION

Performing CTPA to rule out PE in low and very low risk ED patients increases medical costs and increases patient risk, worsening patient outcomes.

SSA05-08 • Variation in Utilization and Positivity Rates of CTPA among Emergency Physicians at an Academic Tertiary Emergency Department

Yingming Amy Chen MD (Presenter) ; Bruce G Gray MD ; Glen Bandiera MD ; David Mackinnon ; Djeven P Deva MBBCh

PURPOSE

This project examines the utilization and diagnostic yield patterns for CT pulmonary angiography (CTPA) ordered by individual Emergency Physicians (EPs) at an academic tertiary care center. The study is part of the institution's quality improvement initiative aimed at establishing quantitative parameters for assessing individual EPs' image utilization.

METHOD AND MATERIALS

A cross-sectional retrospective study was conducted on 850 consecutive ED patients with suspected pulmonary embolism (PE) who underwent CTPA. Radiology report data was extracted from our institution's RIS PACS software (syngo Imaging, Siemens) based on a targeted search of all CTPA reports from January 2010 to December 2012. Positivity rate for PE as well as nonthrombotic clinically significant findings were calculated. Utilization rates and positivity rates for individual physicians were calculated and correlated with both years of experience and certification.

RESULTS

Acute PE was diagnosed in 142 of the 850 patients evaluated by CTPA (16.7%). A further 25.2% of scans were negative for PE but had other clinically significant findings: 11.2% infection, 2.7% pulmonary edema, 2.9% effusion, 3.1% tumour, and 4.9% other. EPs ordered an average of 0.5 CTPA scans per 100 patients seen, with a significant variation across EPs in utilization (0.2 to 1 scans per 100 patients). Considerable variation also existed in the positivity rate for PE, ranging between 6.5% and 38.9%. There was no significant correlation between EP years of experience and utilization rate (linear regression $r = -0.27$; ANOVA $p = 0.36$ for 20 years) or positivity rate ($r = -0.32$; ANOVA $p = 0.39$). Furthermore, utilization and positivity rates were not significantly different between EPs with emergency medicine certification by the Royal College (FRCP) vs by the College of Family Physicians of Canada (CCFP-EM) (student t-test $p = 0.34$ for utilization rate, $p = 0.56$ for positivity rate).

CONCLUSION

While average utilization and positivity rates of CTPA for ED patients with suspected PE at our institution are comparable to those in the literature, considerable interphysician variability exists for both metrics. Utilization and positivity rates for CTPA did not correlate with either the physicians' years of experience or specialty certification.

CLINICAL RELEVANCE/APPLICATION

Results of the study suggest an opportunity for a more standardized approach to the use of CTPA among EPs.

SSA05-09 • Comparison between CT Angiography of the Bronchial and Non-bronchial Systemic Arteries vs. Conventional Angiography in Patients Undergoing Endovascular Treatment of Hemoptysis

PURPOSE

To compare bronchial and nonbronchial systemic CT angiography at 320 multi-detector row computed tomography with conventional angiography in patients undergoing endovascular treatment of hemoptysis.

METHOD AND MATERIALS

A retrospective study including 50 patients (37men, 13women) with hemoptysis of bronchial and nonbronchial systemic artery origins underwent 320 multi-detector CT angiography of the thorax prior to embolization. Findings on CT angiograms, including CT scans, maximum intensity projections, and three-dimensional volume-rendered images, were used to evaluate the depiction of bronchial and nonbronchial systemic arteries. Retrospective analysis of the ostium and the course of bronchial and/or nonbronchial systemic arteries on CT angiograms enabled evaluation of the accuracy of this technique in identification of the relevant vasculature.

RESULTS

Among the 50 patients initially treated with bronchial artery embolization, 56 bronchial arteries were identified at CT angiography. In 94% of cases, concordant findings were observed with both modalities. In five 6% cases, CT could not be used to identify the ostia of bronchial arteries. In 5% cases, CT depicted bronchial arteries that could not be selectively catheterized. Three-dimensional images were found to be superior to 2 D CT angiographic in depicting the ectopic origin of the bronchial arteries, which enabled the interventional radiologists to perform successful embolization after direct catheterization of the ectopic vessel in every case. In 10 % of patients, the nonbronchial systemic origin of bronchial bleeding was identified on CT angiograms.

CONCLUSION

CT angiography using 320 Multi-detector systems provides more accurate depiction of bronchial and nonbronchial systemic arteries than does conventional angiography.

CLINICAL RELEVANCE/APPLICATION

The routine use of 320 CT scan in patients with hemoptysis can help identifying the origin of the bleeding vessels and can improve the efficiency of the the treatment by identifying unexpected vessels

Emergency Radiology - Sunday Posters and Exhibits (12:30pm - 1:00pm)

Sunday, 12:30 PM - 01:00 PM • Lakeside Learning Center

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LL-ERS-SUA • AMA PRA Category 1 Credit™:0.5

Host
Savvas Nicolaou , MD

LL-ERS-SU1A • Hands up! The Effect of Arm Position on Dose and Image Quality in Whole Body CT for Multitrauma

Charlie Sayer MBBS,FRCR ; Sananda Haldar MBBS ; Tharsi Sarvananthan MBBS, MRCS ; Ahmed Dagher MRCP, FRCR (Presenter)

PURPOSE

To investigate the effect of patient arm position on dose, subjective and objective image quality in split bolus whole body CT in polytrauma.

METHOD AND MATERIALS

As part of a large retrospective cohort study at a UK major trauma centre we performed a comparison study of the effect of position the patient with the arms down and the arms up. From a data set of 177 patients scanned over a 9 month period 31 patients were scanned with the arms elevated above the shoulder girdle. Patients were matched for body size and presence of a scoop with 31 patients scanned with both arms down to the sides. Measurement of: Dose (DLP mGy/cm); Subjective image quality in five regions (liver, spleen, aorta, lung bases and T6-L3 vertebrae) using a 3 point scale (1 = no artefact, 2 = minor artefact and 3 = major artefact non-diagnostic); and objective noise (standard deviation (SD) of the average CT number (HU) for a 4cm ROI in liver segment 6/7) was performed for both groups.

RESULTS

There was a significant improvement in the subjective assessment of image quality in all the regions of interest (p < .05). In the arms down group in 96.8% (n=30) of artefact scored 2 or 3 was judged to be predominantly caused by the arms (rather than scoop or external lines). In the arms up group where there was measurable artefact this was most often due to the presence of the scoop (32.3%, n = 10) followed by external lines (12.9%, n = 4). Preliminary data show a reduction in mean dose in the arms up group (1110 mGy/cm vs 1216 mGy/cm), although this difference was not statistically significant (p = 0.11). No significant effect on objective image noise in either the arms up or arms down groups was observed (p = 0.06).

CONCLUSION

When practical and safe to do so positioning the patient with the arms raised results in a significant improvement in subjective image quality and the rate of non-diagnostic scans. Although the effect on dose and objective noise were not statistically significant, trends towards lower dose and improved objective image quality were found.

CLINICAL RELEVANCE/APPLICATION

In whole body trauma CT positioning the patient with the arms raised results in a significant improvement in subjective image quality and the rate of non-diagnostic scans

LL-ERS-SU2A • Sensitivity and Specificity of Chest Radiography and Rib Series for Detection of Rib Fractures

Ryan L Lo MD (Presenter) ; Shelby J Bennett MD ; Heber Macmahon MD *

PURPOSE

It is the current standard of practice to perform chest radiography in patients with suspected rib fractures, however the sensitivity of chest radiographs and rib series for this purpose has not been defined. Therefore, we performed a study to establish the sensitivity and specificity of chest radiography as compared to dedicated rib radiographs using CT scans as the criterion standard for the detection of traumatic rib fractures.

METHOD AND MATERIALS

We searched the University of Chicago imaging database from January 2009 to June 2012 for chest radiographs (CXR), rib series, and CT reports mentioning rib fracture. Cases were included in the study if the patient has had at least two of three studies (chest radiograph, rib series, or CT) within two months of each other. All CT studies were reviewed, and were considered positive if an acute rib fracture was seen.

RESULTS

Of the 2,670 reports mentioning rib fractures between January 2009 and June 2012, 178 cases from 174 patients were found that met our criteria.

With CT used as the criterion standard, detection of rib fractures on CXR had a sensitivity of 54.7% and a sensitivity of 96.8% and rib series had a sensitivity of 100% and a specificity of 100%. CXR missed 68.8% of rib fractures below the diaphragm whereas rib series did

not miss any. Using rib series as the criterion standard, CXR sensitivity was only 42% though specificity 97%.

CONCLUSION

Rib series have a much better sensitivity for detecting rib fractures when compared with CXR, especially for rib fractures below the diaphragm.

CLINICAL RELEVANCE/APPLICATION

Rib fracture detection on rib series is superior to CXR, and almost equal to CT and is recommended if there is clinical concern for a rib fracture.

LL-ERS-SU3A • Computerized Tomography Correlates with Ventilator Days in Inhalation Injury: Preliminary Data from the Inhalation Severity Injury Scoring System (ISIS) Trial

David L August MD (Presenter) * ; Kevin Foster MD,MBA ; Karen Richey RN ; Dan G Gridley MD ; Michael Peck MD ; Melissa Pressman PhD

PURPOSE

Burn subjects with inhalation injury (II) demonstrate increased morbidity and mortality compared to burn subjects without II. The goal of this multicenter study is to develop a standardized scoring system for II that quantifies and predicts II severity in adults. This study looks at patients enrolled to date.

METHOD AND MATERIALS

Data from burn patients with II enrolled in the ISIS study at one center were evaluated. II was diagnosed based on history, physical exam, lab data, and bronchoscopy findings. II severity was scored on a scale of 1-5 for carbon staining, edema, secretion, and erythema. Data included demographics, burn and II data, and outcome. Outcome data included mortality, ventilator days, ICU days, bronchoscopy score, and CT findings. Descriptive data was calculated and correlated to assess for presence and strength of associations among variables.

RESULTS

7 subjects were enrolled with II during the first 9 months of the study. Average age was 58 years, 86% male. Mechanism of injury for all subjects was flame/fire. Mean total body surface area burned was 20.3% (range 0-80%). Average ventilator time was 17 days, length of stay 21 days, with one subject still inpatient, and 1 death (14%). Average total bronchoscopy score was 7.9 (range 3-11). Average score for II severity was 3.3 (range 1-4) for carbon staining, 2 (range 0-3) for edema, 1.6 (range 1-2) for secretions, and 1 (range 0-2) for erythema. 43% of patients had pleural effusion, none with pneumothorax or tracheal/bronchial abnormalities present on CT. Average CT score/slice was 3.0 (range 0.8-5.1) and fraction of abnormal lung tissue (FALT) was 6.8% (range 0.1-18.6%). No bronchoscopies or CT were stopped early secondary to subject condition. There were statistically significant associations (p

CONCLUSION

Preliminary data from ISIS demonstrated CT findings correlate positively with ventilator days in burn patients with II. This suggests that CT scanning may be helpful in predicting the severity of injury and likely clinical course in these patients.

CLINICAL RELEVANCE/APPLICATION

CT scanning may help predict severity and hospital length of stay in the setting of inhalation injury.

LL-ERS-SU4A • Helical Thoracic Computed Tomography Angiography with Individualized Contrast Protocol: Effects on Radiation Dose and Image Quality

Charbel Saade MS (Presenter) ; Ali A Haydar MD, FRCR ; Fadi M El-Merhi MD ; Mukbil H Hourani MD

PURPOSE

To investigate the dose length product (DLP) during helical thoracic CT angiography (CTA) using a patient-specific contrast formula.

METHOD AND MATERIALS

Thoracic CTA was performed in 200 patients with suspected acute aortic syndrome using a 64 channel computed tomography scanner and a dual barrel contrast injector. Patients were subjected in equal numbers to one of two acquisition/contrast regimens. Patient age and gender were equally distributed. Regimen A, the department's standard protocol, consisted of a caudocranial scan direction with 100mL of contrast (Ultravist 370 mgI/mL), intravenously injected at a flow rate of 4.5 mL/s; Regimen B, involved a caudocranial scan direction and a novel contrast formula based on patient cardiovascular dynamics, using 80 mLs of saline at 4.5 mL/s. Each scan acquisition comprised of 120 kVp, 300 mA with modulation, temporal resolution 0.4 sec and pitch 0.981:1. The DLP was measured between each regimen and data generated were compared using Mann-Whitney U non-parametric statistics. Receiver operating characteristic (ROC) analysis and visual grading characteristic (VGC) was performed.

RESULTS

Mean vessel enhancement in the segments of the ascending aorta, transverse and descending aorta all measured were up to 12% (p

CONCLUSION

Significant reduction in radiation dose during helical thoracic CTA can be achieved using low contrast volume based on patient specific contrast formula.

CLINICAL RELEVANCE/APPLICATION

The gold standard in the assessment of acute aortic syndrome is thoracic CT Angiography. Improved arterial opacification and contrast dose reduction provides diagnostic accuracy.

LL-ERE-SU5A • The Acutely Presenting Oncologic Patient: Abdominal Complications

Dinushi S Perera MD (Presenter) ; Hima Prabhakar MD

PURPOSE/AIM

Cancer patients are at increased risk for complications of the abdomen, and given the aging population, more patients with known or unknown malignancy are presenting with acute symptoms. Imaging these patients is often a challenge to the radiologist due to complex pathology. The purpose of this exhibit is to review etiologies for acute abdominal conditions in cancer patients.

CONTENT ORGANIZATION

Pathophysiology: Most abdominal conditions arise from direct effects of the primary tumor and metastases, including invasion of nearby structures, occlusion of vessels, infiltration of abdominal viscera, and tumor hemorrhage. Cases of acute abdominal conditions in the oncologic population at our institution will be presented using a symptoms based approach: 1. Severe abdominal pain - thrombosis of abdominal vessels, infarction of abdominal viscera, bowel perforation 2. Abdominal distention - large volume malignant ascites, hemoperitoneum, bowel obstruction 3. Back pain - hydronephrosis secondary to extrinsic compression of the ureter, pathologic fracture 3. Neurologic symptoms - spinal mass, pelvic mass compressing the sciatic nerve

SUMMARY

When a cancer patient presents with acute abdominal symptoms, knowledge of potential complications related to malignancy will allow the radiologist to make a timely diagnosis and facilitate prompt intervention.

Emergency Radiology - Sunday Posters and Exhibits (1:00pm - 1:30pm)

Sunday, 01:00 PM - 01:30 PM • Lakeside Learning Center

LL-ERS-SU1B • Lower Extremity Arterial Imaging Using a Reduced Tube Voltage and Automatic Tube Current Modulation Technique with 64-slice Computed Tomography

Ying Guo MD (Presenter) ; Dapeng Shi MD ; Ying Hui Ge MD, PhD

PURPOSE

The purpose of this study was to determine whether comparable results to the standard 120kVp protocol could be obtained with reduced radiation dose for lower extremity arterial imaging by 64-slice CT at a tube voltage of 80 kVp.

METHOD AND MATERIALS

Eighty-two consecutive outpatients with lower extremity occlusive disease were randomly divided into three groups. They were scanned with a 64-slices CT scanner by using different scanning techniques. The first group (group1, n=26) used standard 120kVp and fixed tube current of 180mAs (group1), and the second (group2, n=26) and third groups (group3, n=30) used 120kVp and 80kVp with automatic tube current modulation, respectively. We selected the observing levels at pelvic, knee, calf and foot levels for noise measurement and image quality assessment with a 3-point scale. Paired analyses were performed on radiation dose, image quality, and image noise using t-test.

RESULTS

CONCLUSION

Using automatic tube current modulation for lower extremity arterial scanning can reduce radiation dose. Radiation dose can further be reduced with equivalent image quality by using 80 kVp.

CLINICAL RELEVANCE/APPLICATION

Radiation dose can be minimized for lower extremity arterial scanning with optimized scan protocol which includes the use of 80kVp and automatic exposure control.

LL-ERS-SU2B • Whole-body CT in Polytrauma Patients Using Automatic Tube Current Modulation: Impact of a Vacuum Mattress and Spine Board on the Image Quality and the Radiation Dose

Andre Euler MD (Presenter) ; Marc Luthy ; Sebastian T Schindera MD *

PURPOSE

To assess the impact of a vacuum mattress and spine board on image quality and radiation dose in whole-body polytrauma CT using automatic tube current modulation.

METHOD AND MATERIALS

An anthropomorphic whole-body phantom (head, neck, thorax and abdomen) was scanned with a 128-slice MDCT scanner (Somatom Definition Flash, Siemens) with our standard whole-body polytrauma protocol using automatic tube current modulation (120 kVp, 200 reference mAs). Four different setups for the CT scans were applied: the phantom without immobilisation device (setup A), the phantom placed on vacuum mattress 1 (setup B), the phantom placed on vacuum mattress 2 (setup C), and the phantom placed on a spine board (setup D). The major difference between vacuum mattress 1 and 2 was the location of the inflation valve. The image noise was measured and the contrast-to-noise ratio (CNR) was calculated. The location and the degree of artifacts (no, minor, average, severe) was assessed by two radiologists in consensus. The radiation dose was assessed with the volume CT dose index (CTDIvol). Statistical analysis included t-test.

RESULTS

The image noise measured 18.9, 20.9, 20.4 and 20.5 HU in setup A, B, C, and D, respectively ($P < 0.05$). The CNR was 2.8, 2.5, 2.5 and 2.7 in setup A, B, C, and D, respectively ($P < 0.05$). The measured CTDIvol was 7.9, 8.1, 8.3 and 8.5 mGy in setup A, B, C, and D, respectively. Artifacts, which were provoked by the inflation valve, were only detected in the scans with the vacuum mattress. Vacuum mattress of setup B produced severe artifacts at the head, while the vacuum mattress of setup C only had minor artifacts at the shoulder girdle.

CONCLUSION

Applying immobilisation devices for whole-body CT with automatic tube current modulation results only in a minimal increase of the radiation dose. Image quality is only degraded in the proximity of the inflation valve of the vacuum mattress.

CLINICAL RELEVANCE/APPLICATION

From a radiation-dose point of view, immobilisation devices are safe for whole-body CT scans. If possible, the inflation valve of a vacuum mattress has to be placed away from the head and neck region.

LL-ERS-SU3B • Enhanced Pneumothorax Visualization in ICU Patients

Hassan Shoushtari MD (Presenter) ; Julia Ley-Zaporozhan MD ; Yasser Karimzad BSc ; Ravi Menezes PhD ; Devang Odedra BS ; Laura Jimenez-Juan MD ; Leon Zelovitsky ; Narinder S Paul MD *

PURPOSE

To determine whether edge enhancement post processing software improves pneumothorax (PTx) detection in portable chest radiographs (CXR) performed on ICU patients

METHOD AND MATERIALS

206 ICU portable CXR were selected by 2 radiologists such that 103 had a PTx. Each CXR had a complexity score based on image quality, patient size, body rotation and presence of tubes and lines. Each metric was scored 0-3, so each CXR scored 0-12. Each CXR was available as a conventional (C-CXR) and an enhanced (E-CXR) image created using commercially available edge enhancement software. 5 readers (R1-5) with variable experience in CXR interpretation were selected (R1 > 40yrs, R5

RESULTS

There was no significant intra-observer difference in PTx detection for C-CXR at the patient or lung level. **Reader preference:** 3/5 readers strongly preferred E-CXR (95%, 87%, 100%), the 2 other readers either slightly preferred the E-CXR or liked both. Reader preference was not correlated with reader experience. **Diagnostic performance (patient level):** Overall, all readers performed well for PTx detection with accuracy of 78-90% for C-CXR and 82-90% for E-CXR. The only significant difference was for R5 (least experience) with 84% accuracy in PTx detection with E-CXR compared to 78% with C-CXR (pDiagnostic performance (lung level): Overall, all readers performed well, the AUC ranged from 0.819 (C-CXR, least experienced reader) to 0.973 (E-CXR, middle experienced reader). The largest improvement was for R5 with AUC 0.819 (95% CI 0.766, 0.873) in C-CXR to 0.880 (95% CI 0.835, 0.924) with E-CXR. R5 had the largest increase in reader confidence in identifying small PTX with E-CXR (p

CONCLUSION

Edge enhancement software improves reader performance and confidence in identifying PTx in ICU patients. The largest benefit is for inexperienced readers.

CLINICAL RELEVANCE/APPLICATION

PTx detection in ICU patients is important. Often the most inexperienced person is first to read the CXR and edge enhancement software improves their confidence and accuracy in detecting PTx.

LL-ERS-SU4B • Clinical Utility of Fully Integrated Chip CT Detector in Suspected Pulmonary Embolism Imaging

Teresa Liang MD, BSc (Presenter) ; **Patrick McLaughlin** FFRCSCI ; **Graeme J McNeill** MRCP, FFRCSCI ; **Darra T Murphy** FFRCSCI ; **Luck J Louis** MD ; **Tim O'Connell** MD, MEng * ; **Hugue A Ouellette** MD ; **John R Mayo** MD * ; **Savvas Nicolaou** MD

PURPOSE

Recently 3rd generation CT detectors that employ integrated (IC) rather than discrete (DC) electronic circuits have been introduced into clinical practice. Initial phantom studies demonstrated reduced electronic noise and increased spatial resolution, however, the benefits of the IC detectors for diagnosis of pulmonary embolism have yet to be evaluated. We compare both quantitative and qualitative image quality, between the traditional DC detector and a novel IC detector in diagnosis of pulmonary embolism in the acute setting.

METHOD AND MATERIALS

45 consecutive patients underwent CT Pulmonary Angiograms (CTPA) with the DC detector at 100 kV with iterative reconstruction using a 128 slice Dual Source CT scanner. 45 different patients who had been previously scanned using the same CT system with DC detectors were included in this retrospective study. A single blinded reader used graded spatial resolution (sharpness of delineation of edge of vessel/organ from the background) at the main pulmonary trunk, segmental and subsegmental pulmonary vessels and the spleen. Streak artifact from contrast in the superior vena cava was also graded as was overall diagnostic quality. Mean HU and standard deviation of 1cm² regions of interest of the pulmonary arteries, muscle and air were used to calculate signal to noise (SNR) and contrast to noise ratios (CNR).

RESULTS

There was no difference in age, sex, number of pulmonary emboli, and lateral and AP body diameter size between the IC and DC groups. The mean size specific dose estimates were 3.82 mGy and 3.40 mGy for the DC and IC groups respectively (p=0.26). There was no significant difference in SNR (45.0 vs 39.59, p=0.27) or CNR (20.68 vs 20.18, p=0.78) in the DC and IC groups respectively. Subjective analysis showed that spatial resolution at all levels was significantly higher (5 vs 4, 5 vs 3, 5 vs 3, 5 vs 3, p

CONCLUSION

In this study utilization of a fully integrated chip CT detector resulted in improved spatial resolution and reduced streak artifact which improved diagnostic confidence in detecting pulmonary emboli on CT Pulmonary Angiography.

CLINICAL RELEVANCE/APPLICATION

The 3rd generation IC CT detector allows significant streak artifact reduction and improved spatial resolution, allowing better diagnostic confidence in assessment of acute pulmonary embolism.

LL-ERE-SU5B • Acute Abdominal Pain Following Colonoscopy: What Could It Be?

Katherine M Troy MD ; **Robin B Levenson** MD (Presenter)

PURPOSE/AIM

To discuss colonoscopy complications that may be seen on CT in patients presenting to the emergency department (ED) with acute abdominopelvic (AP) pain status post recent colonoscopy. To review various imaging findings that can be seen on ED AP CT in patient's status post recent colonoscopy and demonstrate case examples. To provide radiologist awareness and understanding of these potential findings to help optimize diagnosis.

CONTENT ORGANIZATION

1. Introduction/Background 2. Colonoscopy. 3. Describe potential findings seen on Emergency Department abdominopelvic CT in patients presenting with acute abdominopelvic pain status post recent colonoscopy. Review imaging features and demonstrate imaging examples, including a. Appendicitis b. Diverticulitis c. Splenic injury and hemoperitoneum d. Bowel perforation d. Bowel wall hematoma. 5. Management and Conclusions

SUMMARY

Patients may present to the emergency department with acute abdominal pain following recent colonoscopy. It is imperative that the emergency radiologist is aware of the various potential post-colonoscopy imaging findings and related complications that can be seen on CT to optimize diagnosis.

Traumatic Brain Injury

Sunday, 02:00 PM - 03:30 PM • S406B

ER **MR** **CT** **NR**

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RC105 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC105A • CT and MR Imaging in Head Trauma

Paul M Parizel MD, PhD (Presenter) *

LEARNING OBJECTIVES

1) To develop a standardized pattern analysis approach for interpreting imaging studies in patients admitted with head trauma. 2) To become familiar with the different types of traumatic brain injuries and their imaging patterns. 3) To learn about the imaging characteristics of various types of intracranial haemorrhage by CT and MR. 4) To be able to recognise imaging findings that can serve as (surrogate) imaging biomarkers for patient prognosis and outcome.

ABSTRACT

CT and MRI examinations constitute an essential part of the diagnostic work-up of patients with head trauma. In the acute setting, imaging findings determine patient management and greatly influence the clinical course. CT remains the first choice technique to determine the presence and extent of injuries, and to guide surgical planning. Multi-detector CT allows simultaneous assessment of head and cervical spine, obviating the need for plain X-rays. A standardized pattern analysis approach will be presented, to obtain a complete inventory of the traumatic brain lesions. From a clinical point of view, it is important to understand the difference between primary and secondary lesions. Primary injuries occur as a direct result of the impact with damage to brain tissue. Examples include fractures, different types of traumatic haemorrhage (epidural, subdural, intracerebral, subarachnoid), cerebral contusion, diffuse axonal injury (DAI). CT-angiography is useful to document traumatic blood vessel injury. Secondary injuries are caused by systemic factors such as increased intracranial pressure, edema, brain herniation, decreased cerebral blood flow, excitotoxic damage. These lesions can be documented with multiparametric MRI including diffusion, perfusion, and susceptibility-weighted imaging. Whenever there is a discrepancy between the patient's clinical status and imaging findings, MRI is indicated. Diffusion tensor imaging with fractional anisotropy mapping may show microstructural abnormalities in patients with mild TBI, even when traditional MRI sequences appear normal. Neuroimaging also plays a role in the chronic stage, identifying sequelae, determining prognosis, and guiding rehabilitation. In conclusion, recent technological advances in CT and MRI have greatly improved our understanding of the pathophysiology of craniocerebral trauma and allow us to detect abnormalities, even in patients with mild head trauma, when routine imaging studies appear normal.

RC105B • Concussion: From Head Bumps to Dementia Pugilistica

Michael N Brant-Zawadzki MD (Presenter)

LEARNING OBJECTIVES

1) The audience will understand the challenges in understanding the concept of minimally traumatic brain injury.

RC105C • DTI of Mild Traumatic Brain Injury

Pratik Mukherjee MD, PhD (Presenter) *

LEARNING OBJECTIVES

1) To understand the potential of magnetoencephalography (MEG) for better diagnosis in mild traumatic brain injury (TBI). 2) To review the current best practices for imaging of sports concussions and the findings of recent imaging research studies of athletes. 3) To provide an overview of blast injury and other special characteristics of TBI in military populations, with the most recent results from imaging studies.

Imaging of the Traumatized Spine (Traditional) (An Interactive Session)

Sunday, 02:00 PM - 03:30 PM • E353B

ER NR MK

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RC108 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC108A • Pediatric Cervical Spine Trauma: When is Cross-Sectional Imaging Needed?

Susan D John MD (Presenter)

LEARNING OBJECTIVES

1) Plan safe and effective imaging protocols using cross-sectional imaging for cervical spine injuries in infants and children. 2) Understand mechanisms and patterns of pediatric cervical spine injuries. 3) Recognize common anatomical variations and subtle injuries that benefit from evaluation by CT and MRI.

RC108B • Craniocervical Trauma: When to do CT Angiography

Clint W Sliker MD (Presenter)

LEARNING OBJECTIVES

1) Discuss the value and role of CT angiography when used to evaluate patients with a history of blunt trauma with special attention directed towards screening for craniocervical arterial injuries. 2) Briefly discuss the value and role of CT angiography when used to evaluate patients with a history of acute craniocervical penetrating trauma.

ABSTRACT

RC108C • MRI in Acute Spine Trauma: What and When?

Mauricio Castillo MD (Presenter)

LEARNING OBJECTIVES

1) To understand benefits and limitations of MRI and CT evaluation of spinal trauma. 2) To review current MR and CT imaging protocols in cervical trauma. 3) To review the most common MRI findings in cervical spine trauma and how they affect treatment. 4) To become aware of potential complications from imaging. 5) To review the utility of MR and CT in soft tissue injuries including: ligaments, discs, cord, and blood vessels.

ABSTRACT

This presentation addresses the benefits/drawbacks of MRI vs. CT in the setting of acute cervical spine trauma. MRI has a higher sensitivity and specificity in detecting soft tissue and ligament injuries than CT and radiographs. MRI can also substitute dynamic fluoroscopy to assess instability. Although controversial, MRI is also considered by many the "gold" standard in obtunded patients and children. Because of concern of radiation exposure in children, CT is recommended only in special situations and the evaluation of these patients begins with radiographs and is followed by MRI. The use of MRI in evaluating the integrity of the transverse ligaments in patients with Jefferson injuries identifies those for whom surgery is required and in Hangman fractures those with compressive and/or intrinsic cord lesions. When moving these patients to an MR unit it should be remembered that there is an increased risk of secondary brain injury, increased intracranial pressure, and aspiration. Nearly 50% of patients with significant cervical trauma will have herniated discs visible only by MRI. Many patients also show epidural and/or subdural spinal hematomas and MR depicts each type making the surgeon aware of the need for more extensive and difficult surgery when the blood clot is in the subdural space. Evacuation of the hematoma is imperative to prevent cord damage. The term "SCIWORA" refers to a damaged cord in absence of bone and ligamentous injuries. It occurs in young children and elders with degenerative disease. MRI shows cord hemorrhage and edema and also helps confirm the clinical diagnosis of central cord syndrome. Transections of the cord are clearly assessed with the level of the upper stump determining level of function. Lastly, MRI is critical in assessing acute and subacute vertebral artery dissections. MRI permits direct evaluation of the 3 findings that determine patients neurological outcome: maximum cord compression, cord hemorrhage, and cord swelling.

Hot Topic Session: Concussion and Traumatic Brain Injury

Monday, 07:15 AM - 08:15 AM • E451B

ER NR

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SPSH20 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

Pratik Mukherjee, MD, PhD *

LEARNING OBJECTIVES

1) To understand the potential of magnetoencephalography (MEG) for better diagnosis in mild traumatic brain injury (TBI). 2) To review the current best practices for imaging of sports concussions and the findings of recent imaging research studies of athletes. 3) To provide an overview of blast injury and other special characteristics of TBI in military populations, with the most recent results from imaging studies.

SPSH20A • MEG of Mild Traumatic Brain Injury: A New Frontier

Mingxiang Huang PhD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH20B • Imaging of Sports Concussion

Michael M Zeineh PhD, MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH20C • Imaging of Military TBI

Gerard Riedy PhD, MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

Interventional Stroke Treatment: Practical Techniques and Protocols (How-to Workshop)

Monday, 08:30 AM - 10:00 AM • S403A

ER **IR** **NR**

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RC250 • *AMA PRA Category 1 Credit*™:1.5 • *ARRT Category A+* Credit:1.5

Gary R Duckwiler, MD *

Joshua A Hirsch, MD *

David J Fiorella, MD, PhD *

LEARNING OBJECTIVES

1) Describe the diagnostic evaluation and decision making algorithms leading to urgent endovascular treatment of acute stroke. 2) Review endovascular techniques for the treatment of acute stroke from microcatheter set up to intraarterial thrombolysis to mechanical thrombectomy. 3) Discuss case examples of endovascular treatment including patient selection, technique, and pitfalls.

ABSTRACT

Advance imaging selection for the endovascular treatment of stroke is a topic that has been extensively reviewed in scientific meetings and journals that cater to Neuroradiologists. The MGH Neuroradiology Division was in an unusual position of having performed thousands of unenhanced CT, perfusion CT studies and MRI as patients presented through the Emergency Department with stroke over a multi-year period. The Neuroradiology division convened a two week lecture series and formed an expert panel to review our experience and the evidence for neuroimaging in stroke. Based on this review, a new algorithm was adopted that-based approach to develop the neuroimaging algorithm for patient with presumed anterior circulation occlusion (ACO) that includes: noncontrast CT to identify hemorrhage and large hypodensity followed by CT angiography to identify the ACO; diffusion MRI to estimate the core infarct; NIH stroke scale in conjunction with the diffusion data to estimate the clinical penumbra.

Emergency Radiology Series: Advanced Concepts in Imaging of Trauma

Monday, 08:30 AM - 12:00 PM • E350

ER **CT**

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VSER21 • *AMA PRA Category 1 Credit*™:3.75 • *ARRT Category A+* Credit:4

Moderator

Mariano Scaglione, MD

Moderator

Clint W Sliker, MD

VSER21-01 • Penetrating Wounds to the Torso: Evaluation with Multi-Detector CT

Felipe Munera MD (Presenter)

LEARNING OBJECTIVES

1) To discuss the role of MDCT in patients with penetrating torso trauma. 2) Describe MDCT protocol for penetrating torso injuries. 3) Review the MDCT findings of selected penetrating abdominal injuries.

ABSTRACT

Penetrating injuries account for a large percentage of visits to emergency departments and trauma centers worldwide. Emergency laparotomy is the accepted standard of care in patients with a penetrating torso injury who are not hemodynamically stable and have a clinical indication for exploratory laparotomy, such as evisceration or gastrointestinal bleeding. Continuous advances in technology have made MDCT an indispensable tool in the evaluation of many patients who are hemodynamically stable, have no clinical indication for exploratory laparotomy, and are candidates for conservative treatment. Multidetector CT may depict the trajectory of a penetrating injury and help determine what type of intervention is necessary on the basis of findings such as active arterial extravasation and major vascular, hollow viscus, or diaphragmatic injuries. Because multidetector CT plays an increasing role in the evaluation of patients with penetrating wounds to the torso, the radiologists who interpret these studies should be familiar with the CT findings that mandate intervention.

VSER21-02 • Value of Contrast-enhanced CT in Detecting Active Hemorrhage Associated to Major Pelvic Trauma and Guiding Angiographic Treatment

Ilenia Di Giampietro (Presenter); **Grazia Loretta Buquicchio**; **Vincenza Di Giacomo**; **Guendalina Menichini** MD; **Michele Galluzzo** MD; **Margherita Trinci** MD; **Stefano Pieri** MD; **Vittorio Miele** MD

PURPOSE

In patients with major abdominal trauma, pelvic fractures associated to active hemorrhage are a common cause of hemodynamic instability. Therapeutic option depends on source and entity of bleeding: arterial hemorrhage requires angiographic embolization; the venous one or that from bone ends is treated conservatively with pelvic packing or external fixator. Our purpose is to establish the role of CT in the detection of active hemorrhage after major pelvic trauma compared to angiography.

METHOD AND MATERIALS

Between 9/2010 and 12/2012, 773 patients with major trauma underwent a CT examination in emergency department. Pelvic fractures were present in 180/773 patients. In all patient affected by pelvic fracture the presence of pelvic hematoma, intra- or retroperitoneal and/or in the soft tissue (glutes, adductors muscles), was searched. Authors look also for the presence of active contrast blush during the early arterial, the portal phase and near the stumps of bone fracture. Angiography was performed in 67 patients after CT detection of active bleeding or in case of not explained hemodynamic instability.

RESULTS

Among 180 patients with pelvic injury, 163 showed a pelvic hematoma; 27 a soft tissue hematoma. At CT active hemorrhage was identified in 47/180 cases (29 bleedings were visible in the arterial phase; 9 in the venous one; 2 in both of them; 11 near bone ends). All 47 patients underwent arteriography who showed hemorrhage in 22/29 cases of arterial bleeding, 3/9 case of venous phase bleeding, 2/11 cases of bleeding near bone ends. 20 patients underwent arteriography without evidence of active bleeding at CT; 4/20 showed active extravasation of contrast material. 2/20 underwent internal iliac embolization even in absence of extravasation.

CONCLUSION

CT has high sensitivity to detect active bleeding and to establish its origin, thus guiding the optimal therapeutic option. Our experience suggest to perform arteriography even in case of bleeding from bone ends or of venous origin, and when there is an hemodynamic

instability without relevant CT findings.

CLINICAL RELEVANCE/APPLICATION

Our study highlights a new flow chart to follow in bleeding trauma of the pelvis in the polytrauma patient

VSER21-03 • Trauma Whole Body MDCT: An Assessment of Image Quality in Conventional Dual Phase and Modified Triphasic Injection

Raghavendra Kamanahalli MD, FRCR ; Nishat Bharwani MBBS ; Elizabeth A Dick MD, FRCR ; Shirley Fetherston BS ; Elika Kashef FRCR (Presenter) *

PURPOSE

To compare image quality of conventional arterial and portal venous (PV) phase CT with 2 modified triphasic injection protocols in trauma patients.

METHOD AND MATERIALS

60 whole body trauma MDCT were included. 20 consecutive MDCT were reviewed in each group. Group A arterial (30s) and PV (60s) phase acquisitions; Group B ♦triphasic♦ contrast injection with acquisition at 60s and Group C ♦modified triphasic♦ injection with acquisition at 70s delay. All patients were imaged on a 256-slice scanner using IV Iomeron 400.

Images were analysed for arterial, venous and parenchymal attenuation profiles with regions of interest in the major arteries, veins and solid abdominal organs.

A 5-point scoring system was used to assess image quality: excellent studies with optimal arterial, venous and parenchymal opacification scored 5 while studies scoring

RESULTS

In 57 of 60 patients (95%) image quality was scored as good or excellent (=4). 1 study from each group scored 3, however all studies were considered to be of diagnostic quality.

With the exception of the common iliac arteries in group C ($p=0.03$), no statistically significant difference was demonstrated in the vascular attenuation using triphasic or conventional protocols. The average HU of the portal vein was significantly higher in group B and C ($p=0.0001$).

Attenuation profiles in the solid abdominal viscera were significantly higher ($p=0.002$) using both triphasic protocols than with conventional protocols.

Triphasic injection scans at 60s delay provided better arterial opacification than at 70s with comparable venous and parenchymal opacification.

CONCLUSION

In polytrauma, comparable image quality can be achieved using a triphasic IV contrast injection protocol with single MDCT acquisition as with conventional trauma MDCT using arterial and PV phase acquisitions.

CLINICAL RELEVANCE/APPLICATION

The use of a triphasic injection protocol with 256-slice MDCT results in dose reduction over conventional arterial followed by PV phase CT in polytrauma patients with no compromise in image quality.

VSER21-04 • Thoracic Spine Fractures in Patients with Minor Trauma: Is the Conventional X-ray Necessary?

Murat Karul MD (Presenter) ; Peter Bannas MD ; Amelie Hoffmann ; Bjorn P Schonngel ; Gerhard B Adam MD ; Jin Yamamura MD

PURPOSE

To investigate the accuracy of biplane radiography in detection of thoracic spine fractures in patients (pts) with minor trauma using multidetector computed tomography (MDCT) as reference and to compare the mean effective dose of both techniques.

METHOD AND MATERIALS

107 consecutive pts (age 67 ± 20 y) with minor trauma of the thoracic spine and low to moderate back pain on physical examination were included retrospectively. All had undergone biplane radiography first, followed by MDCT in a time frame of 10 days because of aggravation of their symptoms. Contingency table was used for classification of screening test results. Both Chi-square test (χ^2) and mean effective dose were used to compare diagnostic methods.

RESULTS

MDCT revealed 77 fractures in 65/107 pts (60.7%). Biplane radiography was true positive in 32 pts (29.9%), false positive in 19 pts (17.8%), true negative in 23 pts (21.5%), and false negative in 33 pts (30.8%), showing a sensitivity of 49.2%, a specificity of 54.7%, a positive predictive value of 62.7%, a negative predictive value of 41.1%, and an accuracy of 51.4%. Most fractures were diagnosed in the thoracolumbar junction (39/77; 50.6%). None of the fractures missed on biplane radiography was unstable. Presence of a fracture on biplane radiography was highly statistical significant, if this was simultaneously proven by MDCT ($\chi^2=7.6$; $p=0.01$). Mean effective dose on biplane radiography was 0.7mSv, and on MDCT was 7.5mSv.

CONCLUSION

Sensitivity and specificity of biplane radiography in diagnosis of thoracic spine fractures in pts with minor trauma are low. The mean effective dose of MDCT was more than 10 times as high as on biplane radiography.

CLINICAL RELEVANCE/APPLICATION

Considering the wide availability of MDCT that is usually necessary for taking significant therapeutic steps, indication for biplane radiography in minor trauma pts should be very restrictive.

VSER21-05 • Solid Organ Injury: What's New?

Kathirkamanathan Shanmuganathan MD (Presenter)

LEARNING OBJECTIVES

1) Demonstrate common and uncommon solid organ injuries. 2) Discuss the performance and utility of arterial phase imaging the solid organs. 3) Compare liver and splenic injury.

ABSTRACT

VSER21-06 • Hyperdense Adrenal Glands on Contrast-enhanced CT Scans: Evaluation of the Clinical Impact in Polytrauma Patients

Julia Schek MD ; Patric Kroepil MD ; Janina Klasen ; Philipp Heusch MD ; Gerald Antoch MD * ; Rotem S Lanzman MD (Presenter)

PURPOSE

The purpose of this study was to evaluate the clinical impact of hyperdense adrenal glands seen on contrast-enhanced CT scans of polytraumatized patients.

METHOD AND MATERIALS

292 trauma patients (195 male, 97 female, mean age 45.3 ± 23.3 years) undergoing major trauma management in our Level I Trauma Center were included in this retrospective study. Standardized trauma management included CT scans of the brain, cervical spine, chest

and abdomen, which were performed on a 6-row scanner (Emotion 6, Siemens, Erlangen, Germany). CT scans of the chest and abdomen were performed 60 s after the injection of 120 ml of iodated contrast material (Accupaque 300, GE Healthcare) at 110 kV. CT scans were retrospectively reviewed by two radiologists blinded to clinical data in consensus mode. ROIs were drawn in both adrenal glands and the inferior vena cava (IVC) in order to assess Hounsfield Units (HU). Patients were assigned to two groups; Group A (positive group), patients with hyperattenuating adrenal glands (HU adrenal gland > IVC) and Group B (negative group), patients without hyperattenuating adrenal glands (HU adrenal gland < IVC). The severity of injury was determined using the Injury Severity Score (ISS). The clinical outcome was analyzed using the electronic patient record.

RESULTS

18 patients (9 men and 9 women, mean age 42.2 ± 24.2 years) were assigned to Group A (positive group) and 274 patients (186 men and 88 women, mean age 48.4 years ± 22.4) were assigned to Group B (negative group). Average signal intensity of the adrenal glands was 150.8 ± 36.1 HU in group A as compared to 83.7 ± 23.6 in group B ($p < 0.0001$). 8 of 18 (44.4%) patients in group A and 33 of 274 (12.4%) patients in group B died during hospitalization ($p < 0.05$). Patients in group A deceased 2.1 ± 3.7 days following trauma as compared to 6.4 ± 11.8 days in group B. Mean ISS did not differ significantly between both group A and B (26.2 ± 24.0 and 18.06 ± 16.72, respectively) ($p > 0.05$).

CONCLUSION

Polytrauma patients with hyperdense adrenal glands on contrast-enhanced CT scans have a higher mortality rate as compared to patients with regular attenuation of the adrenal glands.

CLINICAL RELEVANCE/APPLICATION

The presence of hyperdense adrenal glands on contrast-enhanced CT scans seems to be a predictor of poor clinical outcome.

VSER21-07 • Can MDCT Features of Mesenteric Injuries Be Used to Predict the Presence of a Surgical Bowel Injury?

Scott D Steenburg MD (Presenter) ; Matthew J Petersen MD

PURPOSE

The purpose of this study was to determine if 64 slice MDCT imaging features of blunt mesenteric injuries can be used to predict the presence of a surgical bowel injury.

METHOD AND MATERIALS

The radiology archives at a Level 1 trauma center were searched over a 5 year period to identify patients with mesenteric injuries seen on admission 64 slice MDCT.

Two board certified emergency radiologists, blinded to clinical outcomes and surgical findings, independently reviewed each case. The size and number of each mesenteric contusion and/or hematoma, the presence or absence of active mesenteric bleeding, bowel wall thickening, free fluid, extraluminal gas, mesenteric vessel termination, mesenteric vessel beading, focal bowel wall defect, bowel wall perfusion abnormality, and bowel wall thickening >3mm were recorded. The radiologists subsequently assessed, based on the imaging findings, if they thought the patient had a surgical bowel injury requiring definitive therapy.

RESULTS

A total of 131 patients with MDCT diagnosis of mesenteric injury were identified. Mean age was 48.7 years (range 18-86) and 66.4% (n=87) were male.

Active bleeding was seen in 14.5% (n=19), bowel wall thickening in 92.3% (n=112) free fluid in 54.2% (n=71), mesenteric vessel termination in 10.7% (n=14), mesenteric vessel beading in 9.9% (n=13), focal bowel wall defect in 3.0% (n=4), and bowel wall perfusion abnormality in 12.2% (n=16) of patients. No patients had extraluminal gas. No patients received oral contrast medium per institutional trauma protocol.

A total of 18 patients underwent laparotomy based on imaging findings and/or clinical exam. Surgical bowel injuries were confirmed in 15 / 18 patients (83.3%). The remaining 113 patients were successfully managed non-operatively with no delayed diagnosis of bowel injury with a mean follow up interval of 527 days (range 1-2012 days).

Active bleeding, free fluid and mesenteric vessel beading were more common in patients with surgical bowel injuries. The accuracy, sensitivity, specificity, PPV and NPV of 64 slice MDCT in predicting the presence of a surgical bowel injury were 74.8%, 80.8%, 74.4%, 28.6% and 96.6%, respectively.

CONCLUSION

MDCT has only modest accuracy and sensitivity for predicting the presence of surgical bowel injuries.

CLINICAL RELEVANCE/APPLICATION

The diagnosis of surgical bowel injuries remains challenging despite 64-slice MDCT technology.

VSER21-08 • QandA/Break

VSER21-09 • CT of Cardiac Trauma in the ED

Sanjeev Bhalla MD (Presenter)

LEARNING OBJECTIVES

1) Understand the spectrum of cardiac injury in the setting of blunt and penetrating trauma mainly on CT. The role of cardiac MR will also be discussed.

VSER21-10 • Radiological Findings and Severity of Injuries in Patients with Acute Alcohol Intoxication

Yuka Morita MD (Presenter) ; Taiki Nozaki MD ; Jay Starkey MD ; Masaki Matsusako MD, PhD ; Hiroshi Yoshioka MD ; Yukihiisa Saida MD ; Yoshinao Sato MD ; Saya Horiuchi MD ; Makoto Goto ; Takaharu Suzuki

PURPOSE

To review the radiological findings of fractures with acute alcohol intoxication and discuss their characteristic features.

METHOD AND MATERIALS

The institutional review board approved this retrospective study with a waiver of informed consent. A total of 1286 adult patients (median age 57.0 years, range 20-102 years; male 748 (58.2%), female 538 (41.8%)) who visited our emergency department (ED) and presented with fractures during July 2010 and December 2011 were retrospectively reviewed. Patients were divided into 2 groups: the intoxicated group and non-intoxicated group before the injury by chart review. Differences of the clinical features and radiological findings were compared between the two groups.

RESULTS

One-hundred and eighty one (14%) patients were grouped into the intoxicated group (median age 51.0 years, range 20-85 years; male 148 (81.8%) and female 33 (18.2%)) and 1105 (86%) were grouped into the non-intoxicated group (median age 58.0 years, range 20-102 years; male 600 (54.3%) and female 505 (45.7%)). The intoxicated group showed higher rate of head/neck fractures and lower rate of extremities than the non-intoxicated group with statistical significance (skull 23.2% vs 5.8%; p

CONCLUSION

The alcohol-intoxicated patients who visit the emergency department are at higher risk of head/neck fractures than non-intoxicated patients.

CLINICAL RELEVANCE/APPLICATION

To understand the characteristic patterns of fractures in alcohol intoxicated patients and the differences from non-intoxicated patients is essential for our radiological assessments.

VSER21-11 • Relevance of Incidental Findings in Seriously Injured Patients - The Necessity of Appropriate Management Procedures

Thomas Lehnert MD (Presenter) ; Josef Matthias Kerl MD * ; Julian L Wichmann MD ; Ralf W Bauer MD * ; Claudia Frellesen ; Thomas J Vogl MD, PhD

PURPOSE

The multislice computed tomography (MSCT) is the gold standard in the initial evaluation of trauma patients. Besides providing information regarding the presence or absence of acute trauma-related injuries, MSCT scans also reveal pathologies unrelated to the trauma which may be clinically significant. The aim of the present study was to determine the frequency and clinical importance of incidental findings in multiple injured patients at a level one trauma centre.

METHOD AND MATERIALS

This is a retrospective analysis of prospectively collected data on 2242 multiple injured patients at a level I trauma centre from 2006 to 2010. A total 2,036 patients (91%) underwent an initial MSCT. The MSCT reports were retrospectively reviewed regarding unexpected findings not related to trauma. These incidental findings were rated on a 4-point level scoring system regarding clinical importance and urgency of initiation of further steps.

RESULTS

1142 (49.9%) of the patients had one or more incidental findings. A total of 2844 incidental findings were detected. Overall 349 tumor findings were noted (12.3% of all incidental findings). 113 findings were suspicious for malignant processes or metastasis. Regarding the clinical importance, 168 (5.9%) of the incidental findings required urgent follow-up (Level 4) and 527 (18.5%) of the incidental findings required a follow-up prior to discharge (Level 3).

CONCLUSION

MSCT in multiple injured patients reveals one or more incidental findings in more than one out of two patients. A scoring system classifying the actual relevance of each incidental finding applicable in daily routine of patient care could be introduced.

CLINICAL RELEVANCE/APPLICATION

The consequent handling of incidental findings may burden trauma surgeons and emergency physicians additionally, but should lead to a responsible health care for the patients.

VSER21-12 • Simplified Approach to Midface Trauma

O. Clark West MD (Presenter) *

LEARNING OBJECTIVES

1) Apply a simplified approach to midface trauma CT as described by James T. Rhea, MD. 2) Identify major patterns of midface injury. 3) Incorporate **◆**butress**◆** terminology into facial CT reports.

VSER21-13 • Comparison of MRI, CT Scan and Plain Hip Radiograph for the Early Diagnosis of Hip Fracture in Emergency Patients

Laleh Daftaribesheli MD (Presenter) ; Shima Aran MD ; Hani H Abujudeh MD, MBA *

PURPOSE

Comparison of hip MRI results with plain hip radiograph and CT, and evaluating their role in diagnosis of patients with suspected hip fracture in emergency room

METHOD AND MATERIALS

The medical records of 314 patients who had MRI in emergency room of Massachusetts General Hospital from January 2008 to January 2013 with a suspected hip fracture were retrospectively reviewed. Patients **◆** mean age was 63 years old and 70% of patients were female. 281/314 had hip x-ray and 18/314 had both MRI and CT in addition to x-ray

RESULTS

MRI could diagnose 96/314 patients with hip fracture, 6/96 reports were non definitive. X-ray reported 27/281 positive cases with 16/27 being non definitive. CT was positive in 9/18, with 1/9 being non definitive. In patients with all 3 examinations, according to MRI 9/18 patients had fractures and 9/18 were negative. In 12/18 cases MRI and CT report were completely consistent with each other. In 2/18 patients both CT and x-ray were negative for the fractures reported in MRI. In one case (1/18) with positive CT and negative x-ray happened to be negative by MRI.

Of 90/314 definite cases with MRI, 88/90 patients had plain hip x-ray which was positive in 9/88 patients. In 3/9 its diagnosis was ruled out by MRI. 7/88 of x-ray reports were non definitive for fracture. X-ray reported the wrong site of fracture in 3/88 cases and in 2/88 cases it diagnosed fractures which were ruled out by MRI. Our results showed that plain hip radiograph in addition to being negative in nondisplaced fractures was reported negative in patients with minimally displaced to displaced fractures, and in patients with both types of displaced and nondisplaced. Plain hip radiograph could not detect the fracture in 75/88 (85%) of patients with definite fractures on MRI and in 5/88 (5.6%) of all patients with both examinations it reported false positive fractures or wrong location of the fracture. The sensitivity of plain film in these patients after deleting suspicious cases was found to be only 7.6%.

CONCLUSION

These results favor the advantage of immediate MRI imaging specially in female elderly patients with suspected hip fracture

CLINICAL RELEVANCE/APPLICATION

Use of MRI instead of CT and routine use of plain hip radiograph as a first step in diagnosis of patients with suspected hip fracture in emergency room eliminates the unnecessary exposure to radiation

VSER21-14 • The Degree of Articular Depression as a Predictor of Soft-tissue Injuries in Tibial Plateau Fracture

Marc Regier (Presenter) ; Frank Oliver G Henes MD ; Azien Laqmani ; Gerhard B Adam MD ; Alexander Spiro

PURPOSE

Magnetic resonance imaging (MRI) provides sufficient information with regard to specific soft-tissue injuries in the knee, but in daily clinical routine it is not generally used to evaluate acute tibial plateau fractures. The aim of the present study was to intraindividually evaluate whether the amount of tibial plateau fracture depression at multi-detector computed tomography (MDCT) scans correlates with the incidence of associated soft-tissue injuries determined at MRI.

METHOD AND MATERIALS

A total of 54 consecutive patients with a mean age of 51.2 years (range, 33 **◆** 69 years) were included in this intraindividual comparative study. All patients were admitted to the emergency department of a university medical center with acute tibial plateau fracture. Within the emergency department a 256 slice MDCT was conducted in each patient (Voltage, 120 kVp; current-time product, 110 mAs). Within a mean time interval of 2.8 days (range, 0 **◆** 5 days) MR imaging was performed using standard T1w and T2w sequences at 3 Tesla. Image readout was consensually performed by an experienced musculoskeletal radiologist and an orthopedic traumatologist, who assigned the Schatzker classification and measured the articular depression. Statistical analysis included ANCOVA and logistic regressions.

RESULTS

CONCLUSION

Articular depression assessed by MDCT seems to be a potential predictor of specific meniscal and ligamentous injuries in acute tibial plateau fractures. Therefore, if articular depression is observed at MDCT, MR imaging should generally be recommended in addition with respect to associated soft-tissue lesions.

CLINICAL RELEVANCE/APPLICATION

If articular depression due to acute tibial plateau fracture is detected at MDCT, MRI should be considered indispensable in order to prevent missing concomitant soft-tissue injuries.

VSER21-15 • Panel/QandA

Neuroradiology/Head and Neck (Traumatic Brain Injury)

Monday, 10:30 AM - 12:00 PM • N229



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SSC12 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Pratik Mukherjee, MD, PhD *

Moderator

Gerard Riedy, PhD, MD

SSC12-01 • Six Hour Repeat Head CT for Trauma Patients on Antiplatelets and/or Anticoagulation

Jackson Cheung MD (Presenter) ; **Armando S Herradura** MD ; **Stephen R Baker** MD *

PURPOSE

To determine the efficacy of repeat six-hour head CTs for trauma patients on antiplatelets and/or anticoagulation for delayed intracranial hemorrhage (ICH)

METHOD AND MATERIALS

Retrospective analysis was conducted on all head CTs performed at our institution from the years 2007-2012. Inclusion criteria included availability of initial, repeat head CTs within a six hour period, and data on the type of antiplatelet and/or anticoagulation. Data were obtained from electronic medical records, PACS, and radiology reports. Cases which identified a new ICH on the repeat study were examined for changes in patient management, hospital course, and outcomes.

RESULTS

Preliminary analysis of the 11,562 head CTs performed at our institution during the year 2012 yielded 128 cases meeting inclusion criteria. Incidence of ICH on repeat examination was 1.5% regardless of antiplatelet/anticoagulation type, consistent with previously published studies. Further evaluation of these cases demonstrated that the repeat study did not alter patients' management and outcomes

CONCLUSION

Repeat six hour head CTs for patients on antiplatelet and/or anticoagulation therapy was low-yield for delayed ICH and did not affect patient outcomes. More comprehensive analyses are required to determine the full cost-benefit analysis of a repeat head CT and to identify certain populations which can benefit from a repeat scan.

CLINICAL RELEVANCE/APPLICATION

Our analysis demonstrates these repeat head CTs are unnecessary and only result in increased radiation exposure and costs.

SSC12-02 • The Use of Coronal and Sagittal Reformats in the Evaluation of Post-traumatic Intracranial Hemorrhage

Anil Syal MD (Presenter)

PURPOSE

Evaluate if coronal and sagittal reconstructions are helpful in the evaluation of post-traumatic intra-cranial hemorrhage.

METHOD AND MATERIALS

Approximately 317 cases of acute, post-traumatic intracranial hemorrhage from a level II trauma center over a 16-month period were reviewed. These positive cases were interspersed with an equal number of negative controls. A board-certified neuro-radiologist, a body radiologist and two residents, a PGY-3 and a PGY-4, evaluated each case without any history other than post-traumatic. Evaluators were told to read each study using only axial 5mm slices. After completing the studies, the interpretations were compared to the original readings (which were re-evaluated prior to this study by a separate neuro-radiologist), which were designated as the control report. Any cases of missed post-traumatic intra-cranial hemorrhage were then re-evaluated by the test subject one month later, with the additional aid of coronal and sagittal reformats. Any discrepancies with their original reads were documented. As well, any missed post-traumatic intracranial findings were then viewed in light of their clinical significance, via documented follow-up studies and clinical course.

RESULTS

Preliminary results indicate only a small difference between the rate of positive post-traumatic intracranial bleeds when using only axial images, versus with the aid of coronal and sagittal reformats.

CONCLUSION

The industry standard protocol for a post-traumatic head CT typically includes 2.5 or 5mm axial cuts; where protocols differ is in the use or absence of digital coronal and sagittal reformats. In a review of approximately 600 cases from a level II trauma center, there was minimal difference in the number of positive reported cases. Furthermore, the clinical relevance of these missed findings seen only in one, reformatted plane is of questionable significance, based upon patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Axial images alone are satisfactory in diagnosing clinically relevant post-traumatic intracranial hemorrhage.

SSC12-03 • Utility Assessment of Repeat Head CT in the Setting of Mild Traumatic Brain Injury Using a Natural Language Processing Tool

Jason M Johnson MD (Presenter) ; **Tarik K Alkasab** MD, PhD ; **Daniel Yeh** MD ; **Pamela W Schaefer** MD

PURPOSE

To assess the rate of which repeat head CT following mild traumatic brain injury revealed worsening of imaging findings using a natural language processing tool.

METHOD AND MATERIALS

Utilizing our institutional trauma registry, 824 adults with blunt TBI who arrived within 24 hours of injury, with arrival GCS of >12 with initial head imaging positive for traumatic findings were identified. Patients with initial operative management were excluded, and the all head CTs within 7 days of injury was identified. Each exam was evaluated using a natural language processing (NLP) tool designed for high sensitivity to identify reports describing worsening findings. Imaging reports for 114 patients were manually assessed by an

experienced neuroradiologist and a Kappa score was calculated for agreement between the NLP tool and a human reader.

RESULTS

Of the 819 patients identified, 164 were removed for additional review for having less than 2 CT scans. An additional 30 patients were removed due to initial operative management. Of the remaining 625 patients, 287 had 2 CTs, 172 had 3 CTs and 166 had >3 CTs. Review of the NLP revealed 86% (98/114) algorithm concordance with neuroradiologist review. The majority of the errors (81.3%; 13/16) were NLP overcalls based on the report. Of the 626 patients with at least two CT scans, the second CT scan contained language suggesting worsening in 263 cases (42.0%).

CONCLUSION

A supervised NLP tool can be used in conjunction with a patient registry to identify language associated with worsening head CT findings. We expect to use this tool to further explore clinical factors associated with worsening imaging findings to improve imaging utilization patterns.

CLINICAL RELEVANCE/APPLICATION

This tool may be important for exploring image utilization patterns and outcomes for large populations.

SSC12-04 • Quantitative DTI for Prediction of Neurocognitive Outcome in Severe Traumatic Brain Injury: A Five-year Prospective Cohort

Omid Khalilzadeh MD, MPH (Presenter) ; Julien Dinkel MD ; Vincent Perlbarg PhD ; Louis Puybasset MD, PhD ; Damien P Galanaud MD, PhD * ; Rajiv Gupta PhD, MD

PURPOSE

Prediction of long-term neurocognitive outcome in patients with traumatic brain injury (TBI) is challenging. In this study, we evaluated the prognostic value of DTI, performed in acute-phase after TBI, for prediction of long-term neurocognitive sequelae. For this purpose, we tracked the changes in quantitative DTI parameters over a span of 5 years after the injury.

METHOD AND MATERIALS

Sixteen patients with severe TBI who were admitted to the intensive care unit were enrolled in this prospective study. A baseline MRI was acquired as soon as clinically feasible (within 6 weeks). The MRI scans were repeated at 2 and 5 years after the injury. Patients underwent a neuropsychological evaluation and we assessed the cognitive sequelae and the level of disability based on Glasgow outcome scale, the disability rating scale and the modified Rankin scale. Healthy controls (n=8) were scanned at baseline and at 2-year intervals. Automated segmentation software calculated axial/radial diffusivity and fractional anisotropy in 20 predefined white matter regions. The DTI parameters were normalized using a large set of DTI data from healthy controls. The association of DTI changes with patients' clinical outcome was evaluated.

RESULTS

TBI patients had significantly lower fractional anisotropy and higher radial diffusivity in selected white matter tracts compared with healthy controls. Baseline changes in fractional anisotropy and radial diffusivity in the brain stem, corpus callosum and corona radiata were significantly (p

CONCLUSION

Acute changes in fractional anisotropy and radial diffusivity after severe TBI can predict long-term neurological sequelae with high confidence. DTI changes in the body/genu of the corpus callosum provide the best long-term prognostic value for severe TBI.

CLINICAL RELEVANCE/APPLICATION

Quantitative DTI can be used as a prognostic tool for prediction of long-term neurocognitive outcome in severe traumatic brain injury.

SSC12-05 • Diffusion Tensor Imaging and Neuropsychological Performance in Post-acute Blast-induced Traumatic Brain Injury among U.S. Military Veterans

Thomas M Malone BA (Presenter) ; Jacob Bolzenius BA ; Mark Colijn MS ; Evan Schulze BA ; P. T Roskos PhD ; Richard R Bucholz ; Jeffrey D Stout

PURPOSE

Operations Iraqi Freedom and Enduring Freedom have resulted in a returning veterans with an approximately 20% exposure rate to blast-induced mild traumatic brain injury (mTBI)[1]. Standard neuroimaging (MRI/CT) lacks sensitivity to mTBI; however, some research has shown evidence that Diffusion Tensor Imaging (DTI) can identify white matter injury [2, 3]. DTI measures the local diffusion profile of tissue and can characterize the microstructural integrity of white matter. In this study, we compared DTI derived fractional anisotropy (FA) values in veterans with post-acute blast mTBI versus healthy controls (HCs) and examined the association between FA and neuropsychological measures.

METHOD AND MATERIALS

Data were acquired using a 3T Philips Achieva scanner. Participants included: 10 veterans with blast mTBI (average of 51.30 months post-injury) and 10 HCs. DTI data were pre-processed using FSL 5.0 and regions of interest (ROIs) were hand-traced using FSLview. The ROIs consisted of the genu and splenium of the corpus callosum and the anterior and posterior limbs of the internal capsule, bilaterally. Average FA values from each ROI were calculated for statistical analysis.

RESULTS

Comparison of FA values using independent sample t-tests showed significant differences between groups in the posterior limb of the internal capsule, bilaterally (p

CONCLUSION

Results indicate that DTI is sensitive to group differences in blast-related mTBI, even in the post-acute phase. This suggests presence of a long-term impact of blast injury on the brain. Paradoxically, higher FA values and lower neuropsychological scores were found among veterans with mTBI.

CLINICAL RELEVANCE/APPLICATION

DTI shows promise in enhanced sensitivity for detecting mTBI compared to MRI/CT. Identification of changes in specific brain regions may help in diagnosis and treatment of mTBI among veterans.

SSC12-06 • Association of Thalamic Iron and Frontal White Matter Diffusion Changes: Longitudinal Findings after Mild Traumatic Brain Injury (MTBI)

Martin Kopeck MD (Presenter) ; Yulin Ge MD ; Robert I Grossman MD ; Yvonne W Lui MD

PURPOSE

Thalamic iron has been shown to be elevated after a single concussive episode. The thalamus is a hub for numerous cortical connections, particularly of interest in MTBI are frontocortical connections to areas responsible for executive function. Fractional anisotropy (FA) is a sensitive measure of white matter microstructural integrity after concussion. It is not known whether iron accumulating from secondary injury is related to degree of white matter structural change. The purpose of this study is to correlate thalamic iron using magnetic field correlation imaging (MFC) and frontal white matter microstructure changes using Diffusion Tensor Imaging (DTI) in a cohort of MTBI patients over the first year after injury.

METHOD AND MATERIALS

27 patients with documented MTBI determined by American College of Rehabilitation Medicine criteria were prospectively enrolled with longitudinal data available in 14 subjects. Evaluation included 3 Tesla MRI performed at 1 month and 1 year after injury. Microscopic MFC, an iron marker, and DTI were performed. Thalamic microscopic MFC values using region of interest analysis and frontal white

matter FA (FWM-FA) were obtained at both time points. Pearson correlation coefficient was calculated.

RESULTS

27 subjects studied at the first time point (21 males, 6 females; mean age of 33.2 years) and 14 followed at both time points (11 males, 3 females; mean age of 34.6 years) were imaged at a mean of 27 and 422 days after injury. Average thalamic microscopic MFC was 123.5 and 126.2 at 1 month and 1 year, respectively. Average FWM-FA was 0.378 and 0.381. At 1 month, no correlation was found between thalamic microscopic MFC and FWM-FA; however, at 1 year, thalamic microscopic MFC values were highly correlated with a reduction in FWM-FA ($r=-0.7$, $p=0.0007$).

CONCLUSION

1 year after injury an association emerges between higher thalamic iron measures and frontal white matter microstructural changes. This demonstrates the first reported connection between white matter injury and iron accumulation in MTBI.

CLINICAL RELEVANCE/APPLICATION

We demonstrate a link between thalamic iron metrics and frontal white matter microstructural changes. These data suggest iron may contribute to secondary injury after MTBI.

SSC12-07 • Linking Microstructural Injury and Functional Outcome in Mild Traumatic Brain Injury (mTBI): A Role for Resting fMRI

Susan Sotardi MD, MS (Presenter) ; Jeremy Smith PhD ; Michael L Lipton MD, PhD

PURPOSE

To characterize brain network alterations related to prefrontal traumatic axonal injury (TAI) in mTBI patients. We hypothesized that prefrontal resting network connectivity related to left dorsolateral prefrontal cortex, previously associated with TAI and executive dysfunction in this patient group, would be abnormal in comparison to uninjured controls.

METHOD AND MATERIALS

Informed consent was obtained from 11 mTBI patients (ages 21-62) within 2 weeks of injury and 9 healthy control subjects, in compliance with HIPAA. Using a GE-EPI time series (TE=40; voxel size 8ul), resting fMRI was performed on a Philips Achieva TX 3.0T MR scanner. Preprocessing was performed in FSL, including motion and slice timing correction, nuisance vector (noise and CSF) regression, FILM prewhitening and registration to the Johns Hopkins University template. Mean signal timecourses from right- and left-hemisphere dorsolateral prefrontal cortex (DLPFC; BA 9/46) and rostral prefrontal cortex (RPFC; BA10) were used as seed regions (predictors) in voxelwise correlation analyses for each subject. Comparison between mTBI patients and controls was performed using unpaired, unpaired t-tests, with Bonferroni correction.

RESULTS

We have previously demonstrated low left DLPFC fractional anisotropy and impaired executive function (Austin maze and CPT) in this patient group. Using resting fMRI, left DLPFC was significantly more highly correlated with both right and left RPFC (t-stat -5.67 and -5.61, p

CONCLUSION

We demonstrate enhanced correlation of resting state fMRI activity within left prefrontal networks implicated in executive function. Enhanced correlation among resting networks has been described in pathologic states, including TBI, as evidence of reduced network functional efficiency. The spatial and functional relationship between resting fMRI findings (DLPFC-RPFC network), previously demonstrated DTI evidence of TAI (DLPFC) and functional impairment (executive dysfunction), reveals physiologic consequences that can link microstructural pathology to functional consequences in mTBI patients.

CLINICAL RELEVANCE/APPLICATION

Resting fMRI reveals brain network dysfunction that links TBI pathology and functional consequences. This approach can facilitate integrative assessment of brain substrates of post-TBI dysfunction.

SSC12-08 • Altered White Matter Microstructure as Vulnerability Factors and Acquired Signs of Traffic Accident-induced PTSD

Yawen Sun (Presenter) ; Yan Zhou PhD ; Zhen Wang ; Weina Ding ; Zhi Guo Zhuang ; Yong Zhang ; Yijun Liu ; Jianrong Xu

PURPOSE

White matter (WM) microstructures changes have been found in patients with chronic and new onset posttraumatic stress disorder (PTSD). Whether such WM changes are stress-induced or not, precursors for this vulnerability remain unclear. The aim of the current study was to identify susceptibility factors relating to the development of PTSD and to examine the ability of these factors to predict the course of longitudinal PTSD.

METHOD AND MATERIALS

A total of 62 participants who experienced traffic accidents underwent diffusion-weighted imaging using a 3.0T MRI system within 2 days after their accidents. Among them, 21 participants were diagnosed with PTSD, at 1 month or 6 months using the Clinician-Administered PTSD Scale (CAPS), and 10 patients with PTSD underwent the second MRI scanning up diagnosis. Voxel-based analysis (VBA) was performed on fractional anisotropy (FA) images to assess the differences in the WM microstructures across the whole brain between the groups. Assessing the relationship between PTSD symptom severity and WM microstructures, the correlation between the CAPS at diagnosis and the FA values in the brain regions of interest was also examined.

RESULTS

Compared with the trauma-exposed control group, the PTSD group showed lower FA values in the right anterior cingulate cortex, right middle temporal gyrus, right midbrain, and left gyrus rectus/medial orbitofrontal cortex within 2 days after trauma. Importantly, the reduced FA values in the left gyrus rectus at the acute phase predicted greater future CAPS scores. In addition, we found decreased FA values in the left insula in the follow-up scan in the patients with PTSD, which correlated with the decrease in FA values in the left gyrus rectus in their first scan.

CONCLUSION

These results suggested that the WM microstructure has already changed within 2 days after the initial trauma in the individuals who would later on develop PTSD. Furthermore, the reduced FA values in the ventromedial prefrontal cortex region could be established as a vulnerability neuroimaging marker that predicts future development of PTSD symptoms and might also provide an outcome prediction of the acquired signs of PTSD, focusing on reduced FA values in the insula.

CLINICAL RELEVANCE/APPLICATION

Identify the susceptibility factors relating to the development of PTSD and examine the ability of these factors to predict the course of longitudinal PTSD.

SSC12-09 • Clinical Implication of Early 3T-MR with Susceptibility Weighted (SWI) and Blood Flow (ASL) Imaging in Collegiate Athletes with Mild Traumatic Brain Injury: Preliminary Report

Anna Ellermeier MD (Presenter) ; Heather Spader ; Zahid Jethani ; Jason T Machan PhD ; William C Lafrance ; Michael Worden ; Kaspr De Johst ; Michael J Hulstyn ; Neha Raukar ; Jeffrey M Rogg MD

PURPOSE

Mild traumatic brain injury (mTBI) in young adults accounts for the 2nd highest rate of brain injury in RI State, with increasing emphasis placed on the immediate and long-term effects of these injuries. We report the results of 3T-MR susceptibility weighted (SWI) and

cerebral blood flow (CBF) pulsed arterial spin labeled (ASL) imaging for diagnosis and prognosis assessment in mTBI.

METHOD AND MATERIALS

Following IRB approval, prospective consent was obtained from right-handed college football and rugby athletes. Fourteen (14) athletes with sports-related concussions (GCS 13-15) were enrolled. 3T-MR imaging (Siemens Trio) performed 1-month clinical follow-up; 8 had >3-month clinical and MR follow-up. T1/FLAIR and SWI MR reviewed blindly by a CAQ Neuroradiologist. ASL vascular territory ROI analysis performed using Osirix software, with a general linear model treating MR parameters as multivariate-Gaussian distribution used for statistical analysis.

RESULTS

All subjects had headache, memory/concentration difficulty and/or decreased energy, 36% (5/14) severe; 21% (3/14) had persistent symptoms at 1-month, 14% (2/14) severe. None had abnormal T1 or FLAIR. Two of 14 had SWI hemorrhage (punctate peri-genu and peri-splenium CC) and severe presentation with clinical and imaging resolution at 1-month. ASL showed significantly increased minimum and decreased standard deviation in hippocampus (HIP) CBF post-injury as compared to >3-month delayed intra-subject control (Fig. 1).

CONCLUSION

Our mTBI subjects clinically parallel existing literature. Standard T1 and FLAIR 3T-MR had no relevant findings in the 14 athletes. Though both subjects with SWI blood had severe symptoms, their full recovery suggests prognosis is not affected by SWI findings. ASL showed statistically increased HIP CBF in the acute state, an intriguing finding as existing literature shows elevated baseline HIP CBF in PTSD subjects to correlate with symptom severity. Clinical significance is considered by implication of HIP dysfunction on memory, concentration and mood stability, all associated with mTBI.

CLINICAL RELEVANCE/APPLICATION

In mTBI, 3T-MR SWI may show hemorrhage but does not predict prognosis. We use ASL to show increased hippocampal CBF, supporting literature that suggests this may be clinically relevant.

Emergency Radiology - Monday Posters and Exhibits (12:15pm - 12:45pm)

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LL-ERS-MOA • AMA PRA Category 1 Credit™:0.5

Host
Manickam Kumaravel, MD, FRCR

LL-ERS-MO1A • Lipohaematoma and Fluid Effusion of Wrist Extensor Compartments Associated with Distal Radio Fracture: An Important and Overlooked Finding

Olavo K Nakamura MD (Presenter); Juliana F Guimaraes MD; Luciana S Timbo MD; Luiz Guilherme Hartmann MD; Laercio A Rosemberg MD; Durval D Santos MD; Marcelo B Funari MD

PURPOSE

Traumatic fat and fluid effusion in a tendon sheath, known as lipohaematoma, in the wrist is rarely reported even in the literature. The aim of this study is to correlate the presence of lipohaematoma and fluid effusion in cases of wrist trauma with the pattern, location and severity of distal radio fracture. The frequency of these findings in patients with traumatic radio fracture was also estimated.

METHOD AND MATERIALS

From January to December 2012, 211 CT (137/64%) and MRI (74/36%) exams of patients were reviewed for the presence of distal radio fractures. Each wrist tendon was analyzed individually, looking for fat or/and fluid effusion. Others evaluated findings were the location, pattern and severity of distal radio fracture, such as involvement of Lister tubercle, involvement of wrist dorsal cortical, intra-articular communication, deviated bone fragments and presence of lipohemartrosis.

RESULTS

62/211 (29.3%) retrospectively reviewed cases had distal radio fracture. The mean age was 43.3 years old. The pathologic changes of the sheaths were characterized only in patients who had distal radio fracture and only in the extensor tendons of the wrist. A sheath fluid distention was detected in 25 cases (40.3%) and a lipohaematoma was present in 16 patients (25.8%). The most frequently affected compartments were 2nd and 3rd extensor compartments. The fluid distention of extensor tendons sheaths was significantly associated with dorsal radio fractures ($p=0.008$) and Lister tubercle involvement ($p=0.009$). Additionally, a significant correlation was found between the presence of tendon lipohaematoma and lipohaemartrosis (p

CONCLUSION

Fat and fluid effusion in a tendon sheath is not a rare finding in a post-traumatic wrist MRI and CT exams, probably it has not been systematically evaluated. The traumatic involvement of extensor tendons sheaths is directly related to Lister tubercle involvement, dorsal radio fractures, presence of lipohaemartrosis and deviated bone fragments.

CLINICAL RELEVANCE/APPLICATION

The presence of fluid effusion and lipohaematoma alerts to distal radio fracture with sheath disruption, which can cause persistent wrist pain post trauma and may even result in a tendon rupture.

LL-ERS-MO2A • The Use of Adaptive Statistical Iterative Reconstruction (ASIR) Technique in Evaluation of Patients with Cervical Spine Trauma: Impact on Radiation Dose Reduction and Image Quality

Satya N Patro MD (Presenter); Santanu Chakraborty FRCR; Adnan M Sheikh MD

PURPOSE

The aim of this study is to know the impact of Adaptive Statistical Iterative Reconstruction (ASIR) technique on the image quality and radiation dose reduction in the evaluation of patients with cervical spine blunt trauma. The comparison was made with the traditional Filtered Back Projection (FBP) technique.

METHOD AND MATERIALS

We retrospectively reviewed a total of 154 patients, who underwent emergency cervical spine CT imaging at our institution for blunt cervical trauma from June 2010 to Nov 2010. Out of 154 patients, 96 patients were imaged before the implementation of ASIR technique i.e with traditional FBP technique. The remaining 58 patients were imaged after the implementation of ASIR technique. As per the vendor's recommendation we used a blend of 30% ASIR and 70% FBP in the ASIR category of patients. The patient demographics, radiation dose, objective image signal and noise were recorded; while subjective noise, sharpness, diagnostic acceptability and artefacts were graded by two radiologists blinded to the techniques.

RESULTS

We found that the ASIR technique was able to reduce the CTDIvol and DLP by 50.3% and 54.5% respectively, compared to FBP technique. There was no significant difference of image noise and signal between the two groups. There was excellent inter observer agreement on the subjective image quality and diagnostic acceptability for both ASIR and FBP group.

CONCLUSION

CT imaging of the cervical spine has become the standard technique for exclusion of injury related to blunt trauma. It is essential to reduce the radiation dose without affecting the image quality. Use of ASIR technique allows us to reduce the radiation dose by 50%

without any clinical relevant degradation in the image quality.

CLINICAL RELEVANCE/APPLICATION

It is strongly recommended to use the ASIR technique in routine CT imaging of spine to reduce the radiation dose to the patients.

LL-ERS-MO3A • The Role of MRI in Soft Tissue Injuries of Cervical Blunt Trauma Patients: 5 Years Experience at Level I Trauma Center

Emilio Lozupone MD (Presenter) ; Simona Gaudino MD ; Marco Pileggi ; Eleonora Antichi MD ; Mariacarmela Sciandra MD ; Emiliano Visconti ; Annibale Botto ; Giuseppe M Di Lella MD ; Cesare Colosimo MD

PURPOSE

The diagnostic algorithm for clearance of cervical soft tissue lesions in the blunt trauma patients remains controversial, especially regarding the role of MRI in emergency settings. Multidetector CT (MDCT) can depict significant soft tissue abnormalities, however sensitivity, specificity and conspicuity are by far much lower than in cervical fractures. MRI is high-sensitive in detecting cervical soft tissue lesions, however it is time-consuming, highly cost and difficult to perform in critical ill patients. Our purpose is to investigate the added value of MRI to MDCT in cervical soft tissue injuries, and how MRI findings impacted on the therapeutic decision in blunt trauma patients.

METHOD AND MATERIALS

RESULTS

Main indications to MR scan were: neurologic compromise (56), obtunded/comatose patients (26), severe neck pain (5), unclear CT findings or suggestive of soft tissue injuries (4), other (4). Mean time between CT and MR was 5.9 days. MRI showed soft tissue injuries in 40 patients: spinal cord injuries in 25 patients, ligament injuries in 17 patients, intraspinal extramedullary lesions in 8 patients. CT failed to show ligamentous injuries in 9 patients, intraspinal extramedullary lesions in 5 patients. MRI findings changed the treatment in 4 Pts (3,8 %), all with negative CT.

CONCLUSION

MDCT is enough to evaluate most cervical spine trauma in acute stage. MRI has proved superior to MDCT in depicting soft tissue injuries, however, without significant treatment changes in most cervical trauma patients. Spinal cord damage remains the main indication to MRI in acute stage.

CLINICAL RELEVANCE/APPLICATION

In our experience MRI accurately demonstrates cervical soft tissue injuries in blunt trauma patients, with a poor impact on the clinical management of the trauma.

LL-ERS-MO4A • Thoracic Spine Fractures in Patients with Minor Trauma: Is the Conventional X-ray Necessary?

Murat Karul MD (Presenter) ; Peter Bannas MD ; Amelie Hoffmann ; Bjorn P Schonngel ; Gerhard B Adam MD ; Jin Yamamura MD

PURPOSE

To investigate the accuracy of biplane radiography in detection of thoracic spine fractures in patients (pts) with minor trauma using multidetector computed tomography (MDCT) as reference and to compare the mean effective dose of both techniques.

METHOD AND MATERIALS

107 consecutive pts (age 67±20y) with minor trauma of the thoracic spine and low to moderate back pain on physical examination were included retrospectively. All had undergone biplane radiography first, followed by MDCT in a time frame of 10 days because of aggravation of their symptoms. Contingency table was used for classification of screening test results. Both Chi-square test (χ^2) and mean effective dose were used to compare diagnostic methods.

RESULTS

MDCT revealed 77 fractures in 65/107 pts (60.7%). Biplane radiography was true positive in 32 pts (29.9%), false positive in 19 pts (17.8%), true negative in 23 pts (21.5%), and false negative in 33 pts (30.8%), showing a sensitivity of 49.2%, a specificity of 54.7%, a positive predictive value of 62.7%, a negative predictive value of 41.1%, and an accuracy of 51.4%. Most fractures were diagnosed in the thoracolumbar junction (39/77; 50.6%). None of the fractures missed on biplane radiography was unstable. Presence of a fracture on biplane radiography was highly statistical significant, if this was simultaneously proven by MDCT ($\chi^2=7.6$; $p=0.01$). Mean effective dose on biplane radiography was 0.7mSv, and on MDCT was 7.5mSv.

CONCLUSION

Sensitivity and specificity of biplane radiography in diagnosis of thoracic spine fractures in pts with minor trauma are low. The mean effective dose of MDCT was more than 10 times as high as on biplane radiography.

CLINICAL RELEVANCE/APPLICATION

Considering the wide availability of MDCT that is usually necessary for taking significant therapeutic steps, indication for biplane radiography in minor trauma pts should be very restrictive.

LL-ERS-MO5A • Effectiveness of Second-opinion Imaging Interpretation: A Study in Patients with Cervical Spine CT Scans

Omid Khalilzadeh MD, MPH (Presenter) ; Vinay Batchu ; Patrick C Johnson BS ; Michael T Lu MD ; Robert A Novelline MD ; Garry Choy MD, MS

PURPOSE

A second-opinion can be a valuable resource in confirming proper medical diagnosis and treatment. This study, evaluates the impact of second-opinion (over-read) radiology evaluations of cervical spine CT scans on patients' diagnosis in the emergency setting.

METHOD AND MATERIALS

A total of 311 consecutive cases of cervical spine CT imaging from patients who were transferred to our institution's emergency department were analyzed. These patients received imaging of their cervical spine at an outside facility with an initial first-read. The imaging was subsequently imported to our PACS and over-read (second opinion). A single radiologist compared the first- and secondary-read radiology reports. Compared with the first-reads, the secondary-read reports were classified as: inconsistent findings, consistent findings, and different interpretations of the findings. The rate of discordance between the first- and secondary-reads was assessed. The radiology recommendations in the second scan were classified as: recommendation for re-scan; or scan with a different modality (ultrasound; MR; bone scan; CT angiography or HRCT). The impact of new radiology findings on changing the final diagnosis or hospital admission was assessed.

RESULTS

Patients had different indications for cervical spine CT: evaluation for fracture/dislocation or ligamentous injury (78%); evaluation for spinal cord or nerve root compression (22%, disc herniation; spinal stenosis; degenerative changes); and evaluation for infectious; malignant or inflammatory process in bone (9%). In the secondary reads, about 70% of patients had consistent radiological findings. Inconsistent findings were found in 7% and different interpretations were found in 22% of patients. Request for rescan was made in 30 patients (10%); and request for scan with another modality was made in 5 patients (2%). The new radiology findings were in line with change of diagnosis in 11% and admission to hospital in 9% of the patients.

CONCLUSION

This study provides insight on different circumstances that may lead to misdiagnosis or misinterpretation of findings in radiology

assessment of patients with cervical spine CT. Knowledge of these potentials for radiologists can help with faster diagnosis in the first assessment.

CLINICAL RELEVANCE/APPLICATION

Second-opinion interpretation of cervical spine CT scans can impact on patients' diagnosis and management in around 11% of cases.

LL-ERE-MO6A • Maternal Abdominal and Pelvic Trauma: Imaging Choices, Algorithms, Controversies and CT Dose Reduction

Ramit Lamba MD (Presenter) ; Puneet Bhargava MD ; Jasjeet Bindra MBBS ; Chandana G Lall MD ; Michael T Corwin MD ; Douglas S Katz MD

PURPOSE/AIM

1. Review current role of imaging in evaluation of maternal abdominal and pelvic trauma. 2. Discuss limitations of non ionizing modalities (US & MR) for evaluation. 3. Discuss controversies in maternal abdominal trauma imaging and strategies for dose reduction.

CONTENT ORGANIZATION

1. Pregnancy screening 2. Algorithm for imaging and management of maternal abdominal trauma 3. Limitation of FAST scans and controversies in literature 4. Limitation and challenges of MR 5. Challenges of imaging placental abruption 6. Strategies for CT dose reduction 7. Modified low dose CT protocol 8. Fetal doses, stochastic and non stochastic risks 9. Issues related to use of iodinated and gadolinium based agents in pregnancy 10. Informed consent, documentation, fetal dosimetry, dose reporting, genetic counseling

SUMMARY

After reviewing this exhibit the radiologist will have a better understanding of the appropriate use of imaging for management of maternal abdominal trauma, including strategies for CT dose reduction in this special population.

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LL-ERS-MOB • AMA PRA Category 1 Credit™:0.5

LL-ERS-MO1B • A Common Traumatological Dilemma: Can the Clinical Outcome of Distal Radius Fractures be Predicted from Initial Radiographs?

Sanja Trnavac MD (Presenter) ; Markus S Juchems MD *

PURPOSE

The purpose of this study was to investigate whether the displacement of conservatively treated distal radius fractures after complete healing can be predicted from initial radiographs

METHOD AND MATERIALS

Radiographs of 311 patients with a conservatively treated distal radius fracture were analyzed at the time of injury, after closed reduction and after bony consolidation. We measured the dorsal dislocation (DD), the radial angle (RA), and radial shortening (RS) at each time point. The parameters were analyzed separately for metaphyseally stable (A2, C1) and unstable (A3, C2, C3) fractures, according to the AO classification system. Spearman rank correlations and regression functions were determined for the analysis.

RESULTS

151 (49%) fractures were classified as A2, 79 (25%) as A3, 48 (15%) as C1, 29 (9%) as C2, and 4 (1%) as C3. After reduction, the median DD was adjusted by 40%; however, by the time complete healing, the median improvement was only 20%. There were only minor fluctuations in the RA between the three time points. In only 8% of the stable and 14% of the unstable fractures affected by RS, the reduction achieve a gain in length of more than 2 mm that was maintained until complete healing. The highest correlations were found for the DD between the time points reduction and complete healing ($r=0.75$) and for the RA between the time points reduction and complete healing ($r=0.80$).

CONCLUSION

In patients with conservatively treated distal radius fractures, final DD and RA can be predicted from the radiograph after closed reduction.

CLINICAL RELEVANCE/APPLICATION

The clinical outcome of distal radius fractures can be predicted on initial radiographs.

LL-ERS-MO2B • Comparison of Plain Film Radiography and MDCT in Suspected Fractures of the Scaphoid: Re-evaluation of Imaging Algorithm in Daily Practice

Cyrus Behzadi (Presenter) ; Murat Karul MD ; Frank Oliver G Henes MD ; Philip Catala-Lehnen ; Gerhard B Adam MD ; Marc Regier

PURPOSE

To intraindividually compare and evaluate biplane radiography and multidetector computed tomography (MDCT) under consideration of accurate detection of suspected scaphoid fractures and individual radiation dose.

METHOD AND MATERIALS

A total of 124 consecutive patients (66 males; 58 females; mean age, 49 ±21 years; range, 16-91 years) were included in this intraindividual comparative study. All patients were admitted to the emergency department of our university medical center with acute trauma of the wrist. Within the emergency department biplane radiography was performed. Within a mean time interval of 0.7 days (range, 0 - 8 days) a 256 slice MDCT was conducted in each patient (voltage, 120 kVp; eff. current-time product, 70 mAs). The clinical examination and MDCT data consensually served as the reference standard. A fourfold table was used for the classification of screening test results. Sensitivity, specificity, positive and negative predictive values, Wilcoxon and Chi square test (?2) and mean effective doses were used to compare the diagnostic value of both techniques.

RESULTS

Reading the biplane radiography data overall 75 fractures were suspected, 34 of which were assigned to acute fracture of the scaphoid. Subsequent MDCT revealed a total 108 fractures in 80 patients, 42 of these were identified as acute scaphoid fractures. Hence, the sensitivity of biplane radiography for the detection of at least one mid-hand fracture was limited to 45.6%. Due to 12 false positive findings the specificity of radiography was only 29.4%. If biplane radiography was used as the exclusive criterion the fracture detection would have been accurate in only 54.8% of all patients. The statistical analysis revealed a distinct superiority of fracture detection at MDCT (p

CONCLUSION

Compared to MDCT, the diagnostic accuracy of biplane radiography in the detection of acute fractures of the wrist and the scaphoid is poor. Concerning its diagnostic superiority mean radiation doses of 0.3 mSv at MDCT have to be considered as negligible.

CLINICAL RELEVANCE/APPLICATION

the presented data suggest that in acute wrist trauma with suspected scaphoid fractures MDCT should serve as the imaging modality of first choice and replace biplane radiography.

LL-ERS-MO3B • Single-pass versus Dual-pass Scanning during Trauma Head and Neck Computed Tomography: Radiation Dose to the Eyes and Thyroid Gland

Charbel Saade MS (Presenter) ; **Zhong Hui Yin** MSc ; **John W Robinson** BSc ; **Elaine Ryan** PhD, MSc

PURPOSE

To investigate the eye and thyroid gland dose during single-pass and dual-pass scans during multidetector computed tomography (MDCT) of trauma head and neck.

METHOD AND MATERIALS

Materials and Methods: head and neck MDCT was performed on 19 patients with trauma to the head and neck using a 64 channel computed tomography scanner (VCT, GE, Connecticut). Patients were allotted into one of two acquisitions. Patient demographics were equally distributed. Group A (n=9), the department's standard protocol, comprised of a head scan from the vertex to the base of skull, and the neck from the clivus to the second thoracic vertebrae; Group B (n=10), involved a craniocaudal scan direction from the vertex of the cranium to the second thoracic vertebrae. Skin entrance dose to eyes and thyroids were measured using GafChromic XR2-QA films (International Specialty Products, Wayne, NJ). Visual grading characteristic (VGC) techniques assessed diagnostic clinical image quality. Data generated were compared between groups using Mann-Whitney U non-parametric statistics.

RESULTS

Results: Mean dose to the thyroid gland demonstrated significant reduction in group B (2.09+0.56 mGy) compared to A (2.74+0.50 mGy) (p = 0.0133). Mean dose to the eyes were non-significant in group B (2.22 + 0.76 mGy) compared to A (2.51 + 0.34 mGy) (p = 0.22). VGC analysis demonstrated significant increase in image quality in group B compared to A within the brain (p = 0.0304) and cervical spine region (cortical outline, p = 0.0087; trabecular pattern, p = 0.0081). Dose length product was reduced in group A (2010.06 + 853.83) compared to B (2289.84 + 714.62) (p=0.22).

CONCLUSION

Conclusion: Optimization of scanner protocols, single-pass scan acquisition and reduced radiation dose to the eye and thyroid, can significantly improve image quality and may increase workflow during trauma MDCT imaging of the head and neck.

CLINICAL RELEVANCE/APPLICATION

Direct radiation effects concerning the eye and thyroid gland are well documented at dual-pass scanning, which results in cataract formation and the development of thyroid malignancy.

LL-ERS-MO4B • Variability in Management Recommendations for Incidental Thyroid Nodules Detected on Computed Tomography of the Cervical Spine in the Emergency Department

Bruce E Lehnert MD (Presenter) ; **Claire K Sandstrom** MD ; **Ken F Linnau** MD,MS

PURPOSE

Thyroid nodules are common incidental findings at computed tomography (CT) however there are no CT based management guidelines, potentially resulting in variability in practice. Demonstrating this variability in practice may illustrate the need for CT based management guidelines for incidental thyroid nodules.

METHOD AND MATERIALS

We retrospectively reviewed radiology reports describing thyroid nodule(s) from consecutive CT cervical spine examinations performed in our Emergency Department (ED) from 01/01/2009 to 12/31/2011. 315 examinations met criteria. The number of nodules, nodule size, and recommended management (US, clinical correlation, clinical follow-up, thyroid serology, comparison with prior studies, nuclear scintigraphy, fine needle aspiration, or no follow-up needed) were recorded.

RESULTS

The mean study age was 64 yrs (+/- 20). 58% were female. 30% (95/315) of the thyroid nodules measured

CONCLUSION

Management recommendations for incidental thyroid nodules detected on CT of the cervical spine in the ED are made inconsistently and the type of management recommended is variable.

CLINICAL RELEVANCE/APPLICATION

There is variability in practice for managing incidental thyroid nodules detected at CT which may benefit from the development of CT based management guidelines

LL-ERS-MO5B • 50% Dose CT in Acute Cervical Spine Injury: Improved Signal and Reduced Artifact at the Cervicothoracic Junction Using Fully Integrated Circuit CT Detectors

Patrick McLaughlin FFRCRCSI ; **Teresa Liang** MD, BSc (Presenter) ; **Graeme J McNeill** MRCP, FFRCRCSI ; **David Tso** MD ; **Luck J Louis** MD ; **Hugue A Ouellette** MD ; **John R Mayo** MD * ; **Savvas Nicolaou** MD

PURPOSE

In this study we compare subjective and objective image quality between 100% dose and 50% dose dual source cervical spine CT datasets obtained using both traditional discrete (DC) and novel fully integrated (IC) detectors.

METHOD AND MATERIALS

22 consecutive patients underwent dual source CT of the cervical spine with conventional DC detectors (DC-CSp) using a dual source 128-slice CT system. A different group of 30 consecutive patients were subsequently scanned after the installation of IC detectors (IC-CSp)(Stellar; Siemens Healthcare, Forchheim, Germany) using the same acquisition protocol (140kv, ref mAs 440, 128x0.6 mm). Raw data from detector A of both datasets were reconstructed to yield half dose images (IC-CSp50 and DC-CSp50) for all patients using a validated technique. Image quality was subjectively graded using a 4-point scoring scheme for osseous and soft tissue definition of the spinal column at C3, C5 and T1 levels. Diagnostic acceptability was also graded from 1-10 for each dataset. Mean HU and SD of 1cm² regions of interest within the spinal canal at C3, C5 and T1 levels served as an objective measure of image quality.

RESULTS

There was no significant difference in CTDIvol, age, sex, and size of patients in DC-CSp or IC-CSp groups. We found no difference in objective or subjective quality between the IC and DC images at 100% dose (p>0.05) but significant differences were elucidated when 50% dose datasets were compared. Diagnostic acceptability was higher on IC-CSp50 vs DC-CSp50 images (8.2 vs 7.6, p=0.09) and definition of the soft tissue structures within spinal canal was significantly improved at the T1 level (3 vs 2.5, p=0.05). Objective analysis revealed a significant reduction in the incidence of streak artifact (mean

CONCLUSION

Use of fully integrated circuit CT detectors improved diagnostic acceptability and significantly reduced the incidence of streak artifact at the cervico-thoracic junction in the acute setting on 50% reduced dose images of the cervical spine.

CLINICAL RELEVANCE/APPLICATION

The fully IC CT detector allows streak artifact reduction and improved visualization of the cervico-thoracic spinal canal, allowing better diagnostic acceptability of lower C-spine at reduced dose.

**SSE06 • AMA PRA Category 1 Credit™:1****Moderator**
Stephen Ledbetter, MD
Moderator
Garry Choy, MD, MS**SSE06-01 • Uncompensated Emergency Department Imaging: An Analysis of 18 Million Services over 4 Years by 2,935 Radiologists Nationwide****Richard Duszak MD (Presenter) ; Eugene Nsiah ; Danny Hughes PhD ; Jeff Maze * ; Martey S Dodoo PhD ; David A Rosman MD *****PURPOSE**

To study the frequency, magnitude, and other characteristics of uncompensated services provided by radiologists in the emergency department (ED) setting

METHOD AND MATERIALS

Using patient- and physician-redacted billing claims for 2,935 radiologists from 40 states between January 2009 through December 2012, 18,475,491 professional services performed in the ED setting were identified. Analysis focused on the 133 of all reported 830 Category I CPT and HCPCS codes which comprised 99.0% (18,296,734) of all rendered services. The frequency, magnitude, and other characteristics of uncompensated (defined as zero payment) radiologist services were analyzed. National 2012 Medicare physician fee schedule amounts were used to estimate dollar value of services.

RESULTS

Of 2,935 radiologists, 2,835 (96.6%) provided uncompensated care to ED patients, averaging \$2,483 per physician per service month. Radiologists received no compensation at all for 28.4% (5,194,732/18,296,734) of services rendered to ED patients. Most frequently rendered services were: 1-view CXR (600,547 uncompensated of 2,885,729 total; 20.8%), 2-view CXR (634,932/2,246,987; 28.3%), non-contrast brain CT (536,947/2,028,049; 26.5%), contrast abdomen/pelvis (AP) CT (147,793/512,816; 28.8%), and non-contrast AP CT (124,844/452,860; 27.6%). Most frequent modalities were radiography (2,916,912/10,664,437 total; 27.4% uncompensated), CT (1,658,511/5,701,654; 29.1%) and US (541,397/1,615,578; 33.5%). Although CT represented 31.2% of ED services, it accounted for 64.8% of uncompensated dollars. Of all uncompensated services, 52.3% (2,714,506) were rendered to uninsured patients and 47.7% (2,480,226) to insured patients (e.g., insurer denial, patient non-payment of deductible).

CONCLUSION

Over 28% of services radiologists rendered by radiologists to ED patients are on a completely uncompensated basis, corresponding to \$2,483 per month per physician. Both frequency and magnitude are likely underestimated by many.

CLINICAL RELEVANCE/APPLICATION

Of services rendered by radiologists to ED patients, 28.4% are without compensation, corresponding to \$2,483 per physician per month. The frequency and magnitude may impact patient access. Of services

SSE06-02 • Structured Physician Order Entry for Trauma CT Scans Improves Clinical Information Transfer and Billing Efficiency in the Emergency Department**Jeremy R Wortman MD (Presenter) ; Aaron D Sodickson MD, PhD ; Asha Goud MD ; Michael H Stella MD ; Ali Raja MD, MBA * ; Anna Poulos ; Dana Marchello****PURPOSE**

To measure the impact of a structured physician order entry system for trauma CT imaging on the clinical information provided to the radiologist, and on associated coding practices and reimbursement success.

METHOD AND MATERIALS

The study was conducted between April 1, 2011 and January 14, 2013 at a quaternary care institution with a Level 1 Trauma Center and 58000 ED visits annually. The intervention implemented in March of 2012 was a structured order entry system for trauma CT scans. The presence in the requisition of clinical signs and symptoms and mechanism of injury, the primary ICD-9-CM code category, the success of reimbursement, and the occurrence of initial reimbursement denials were compared before and after the intervention for head through pelvis trauma CT pan-scans. Chi square statistics were used to compare examinations and patients before and after the intervention.

RESULTS

457 patients received CT pan-scans, including 2734 distinct exam accessions. After the intervention, there was a 62% increase in requisitions containing clinical signs, symptoms, or physical examination findings (from 1% to 63%, $p < .0001$), and a 99% increase in provided mechanism of injury (from 0.4% to 99%, $p < .0001$). There was a 19% increase in primary ICD-9-CM codes representing clinical signs or symptoms (from 3% to 22%, $p < .0001$), and a modest 4% increase in reimbursement success for examinations submitted to insurance carriers (from 91% to 95%, $p = .003$). Rate of initial reimbursement denials dropped 7% (from 24% to 17%, $p = .04$).

CONCLUSION

Implementation of structured physician order entry for trauma CT imaging was associated with a large increase in rate of clinical history provided to the radiologist. This was associated with a decrease in initial reimbursement denials and a modest increase in reimbursement success.

CLINICAL RELEVANCE/APPLICATION

Structured physician order entry for trauma CT imaging can increase the clinical information provided to the radiologist, improve coding practices, and increase reimbursement success and efficiency.

SSE06-03 • The Expanding Role of the Radiologist in Accountable Care Organization (ACO): Improving Adherence to ACO Quality Measures through Detection of Incidental Coronary Artery Calcifications**Jonathan Opraseuth MD ; Ari C Sacks MD (Presenter) ; Alexander J Adduci MD, PhD****PURPOSE**

Evaluate the percentage of patients with incidental coronary artery calcifications on CT and determine if these patients are being appropriately managed according to the proposed new ACO quality measures for patients with ischemic vascular disease, specifically in regards to aspirin/antithrombotic treatment.

METHOD AND MATERIALS

IRB approved, retrospective review of all patients that underwent a Chest CT or CTA in the Emergency Department of a tertiary care, academic medical center between 9/1/2012 and 12/1/2012. The presence of coronary artery calcifications (CAC) was graded as mild, moderate, or severe. The electronic medical records of patients with CACs were evaluated to determine if there was a documented diagnosis of coronary artery disease (CAD) and if these patients were on an antithrombotic medication according to ACO guidelines.

RESULTS

568 consecutive patients had a Chest CT or CTA in the ED between 9/1/2012 and 12/1/2012. 45.4% patients (n=258), average age of 67.4 years (range 30 - 97 years), demonstrated presence of coronary artery calcifications graded as mild (n=125), moderate (n=74), or severe (n=59). Of the patients with CACs, 27.5% (n=71) had a documented diagnosis of CAD and 40.3% (n=104) were on aspirin. Of the patients who were not on aspirin (n=154), 6% (n=10) had a documented allergy or contraindication and 29% (n=44) were on another antithrombotic or anticoagulant. Of the patients with severe CACs, 73% (n=43) were on aspirin or another antithrombotic and 48% (n=28) had a documented diagnosis of CAD.

CONCLUSION

A large subset of patients with coronary artery calcifications incidentally noted on CT do not have documented CAD and are not being adequately treated with antithrombotic therapy according to the newest ACO guidelines. By acting upon this information, radiologists can facilitate early preventative care of coronary artery disease and improve adherence to the ACO guidelines regarding management of patients with ischemic vascular disease.

CLINICAL RELEVANCE/APPLICATION

Detection of incidental coronary artery calcifications identifies patients with undiagnosed coronary artery disease and who may benefit from aspirin/antithrombotic therapy according to ACO guidelines

SSE06-04 • Coronary Artery Calcification Is Often Overlooked in CT Pulmonary Angiograms of Patients with Suspected Pulmonary Thromboembolism

Omid Khalilzadeh MD, MPH (Presenter) ; Patrick C Johnson BS ; Robert A Novelline MD ; Garry Choy MD, MS

PURPOSE

In patients with suspected pulmonary thromboembolism (PTE), coronary artery calcification (CAC) can be an incidental finding in CT pulmonary angiograms. We evaluated the frequency of under-reporting CAC and its association with acute coronary syndrome (ACS) diagnosis.

METHOD AND MATERIALS

Data of 469 consecutive patients suspected for PTE, who were referred to the emergency radiology department for CT pulmonary angiography, were reviewed. Radiology reports were rechecked and positive CAC findings were recorded. All CT pulmonary angiograms were re-evaluated by one radiologist and CAC findings were recorded. The rate of ACS and PTE as final diagnosis for that hospital admission was calculated. The association between CAC and ACS diagnosis was assessed in different subgroups of patients.

RESULTS

About 11.1% of patients had PTE and 43.8% had CAC. CAC was significantly higher in patients with ACS diagnosis than those without (56.2% vs. 40.4%; OR=1.9). There was a strong positive association (OR=3.5) between CAC and ACS in younger patients (age=45 in men, age=55 in women); those without PTE (OR=2.15) and without cardiometabolic risk-factors (OR=3.8). CAC was unreported in 45% of patients with positive CAC (n=98). ACS was the final diagnosis in 31.6% of patients with unreported CAC. There was a significant association between CAC and ACS in patients with unreported CAC (OR=2.18). This association was more prominent in the above subgroups.

CONCLUSION

CAC is often overlooked in emergency CT pulmonary angiograms. CAC is a significant predictor of ACS, particularly in younger patients, those without PTE and cardiometabolic risk-factors. Especially in these sub-groups, radiologists should assess CAC findings.

CLINICAL RELEVANCE/APPLICATION

This study encourages radiologists to more vigilantly look for CAC in emergency CT pulmonary angiograms. Particularly in younger patients, CAC is highly suggestive for ACS diagnosis.

SSE06-05 • Radiology Resident On Call Performance in the Diagnosis of Ectopic Pregnancy Compared to Examinations Performed by Board Certified Sonographers

Alan H Richman MD ; Cynthia L Wallentin MD (Presenter) ; Ichiro Ikuta MD, MMedSc

PURPOSE

To evaluate the technical and interpretive skills of radiology residents in performing ultrasound exams for the emergent diagnosis of ectopic pregnancy.

METHOD AND MATERIALS

All emergency ultrasound exams ordered with a clinical suspicion of ectopic pregnancy were reviewed from 9/01/2011 to 12/31/2012. Out of 182 exams, 98 were performed by a resident with a resident preliminary report issued, and 84 were performed by an ultrasound technologist with a radiology attending final report. Sensitivity and specificity was calculated for radiology residents and ultrasound technologists with manual chart review as the gold standard. In a double-blind fashion, exams were graded for image quality with a 5-point Likert scale, and compared using a Cochran-Mantel-Haenszel test. Former residents were surveyed regarding whether the technical skills acquired in their training benefited them in their fellowship and attending positions.

RESULTS

A total of 22 ectopic pregnancies were found upon chart review. Ectopic pregnancy sensitivity was 69% for residents and 67% for technologist/attending; specificity was 100% for both residents and technologist/attending. Overall image quality demonstrated no statistically significant difference between residents and technologists (Figure). Resident survey reveals that ultrasound technical training is considered a valuable acquired skill.

CONCLUSION

Radiology residents can be trained to emergently perform and correctly diagnose ectopic pregnancy on par with ultrasound technologists and radiology attendings with a similar sensitivity and specificity to published data for the initial ultrasound exam. The comparable image quality ensures a technically adequate exam to ensure patient safety. A survey of former residents reveals that ultrasound technical training is a valuable acquired skill in fellowship and attending positions. Consideration should be given to making ultrasound technical skills an integral part of a diagnostic radiology residency curriculum.

CLINICAL RELEVANCE/APPLICATION

No published study has evaluated the technical skills of radiology residents in performing emergent ultrasound exams in conjunction with the resident's contemporaneous interpretation of those studies.

SSE06-06 • Impact of Resident Training on Imaging Utilization: A Ten Year Perspective at a Level I Trauma Center

Bahman Sayyar Roudsari MD, PhD (Presenter) ; Kevin Psoter ; Jeffrey G Jarvik MD, MPH *

PURPOSE

Little is known regarding utilization of computed tomography (CT) over the course of resident's training in a level I trauma center. In this study, we hypothesized that CT use is higher in early academic year (i.e. July-August) compared to the rest of the year, after adjustment for potential confounding variables, such as injury severity score, that could influence utilization rate.

METHOD AND MATERIALS

We linked Harborview Medical Center (HMC) trauma registry to the HMC billing department data from July 2000 to June 2010. Trauma registry included detailed information regarding patient demography, injury characteristics, trauma care and outcome. Billing data

included detailed information on type and frequency of different body region CTs performed during hospitalization. Number of all CTs, CT head, thorax, abdomen and pelvis were the main outcomes evaluated. The primary exposure of interest was admission in July-August vs. the remainder of the year. Negative binomial regression was used to evaluate the association between month of the year and CT use, adjusting for age, gender, race/ethnicity, year of admission, mechanism and severity of injury, length of hospitalization, ICU admission, and final disposition.

RESULTS

From 2000-2010 a total of 57,544 trauma admissions were recorded. The mean age of the patients was 38 years and 71% were male. On average the patients were hospitalized for 7 days. On average patients underwent 2.9 CTs during hospitalization and the most commonly performed studies for these patients were head (1.1 CTs/person), pelvis (0.5 CTs/person), abdomen (0.4 CTs/person), and thorax (0.2 CTs/person). Patients admitted in July-August underwent slightly higher rate of abdomen (IRR: 1.06; 95% CI: 1.02-1.10), pelvis (IRR: 1.06; 95% CI: 1.02-1.10), and thorax (IRR: 1.06; 95% CI: 1.00-1.12) CTs. No differences were observed for head or extremity CTs.

CONCLUSION

We found that CT chest, abdomen and pelvis were slightly more common at the beginning of the academic year after adjusting for potential confounders. This could be partially due to the limited experience of new residents on trauma service. Our ongoing project further characterizes the factors associated with such observations.

CLINICAL RELEVANCE/APPLICATION

Limited experience of new residents on trauma service could be associated with higher utilization of CT for trauma patients.

Pediatric (Neuroimaging)

Monday, 03:00 PM - 04:00 PM • S102AB

PD ER MR NR

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SSE21 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

Ashok Panigrahy, MD

Moderator

Sarah S Milla, MD

SSE21-01 • Association of Magnetic Resonance Imaging (MRI) Findings and Initial Presenting Symptoms in Infants with Non-accidental Mild Traumatic Brain Injury

Paggie Kim MD (Presenter) ; Mona Tafti MD ; Barbara A Holshouser PhD

PURPOSE

To investigate association between a child's initial presenting symptom and subsequent additional MRI findings after non-accidental mTBI.

METHOD AND MATERIALS

A retrospective single-center review of the emergency room and radiology records of 151 infants, who presented to the Loma Linda University Medical Center Pediatric Emergency Department for evaluation of suspected NAT from 2001 to 2008, was conducted. Inclusion criteria included infants less than 3 years of age with an initial GCS score of 13-15 (i.e., mTBI) who had both a CT and a MRI brain examination available for review. Records were examined for the occurrence of initial symptoms and the presence on imaging of intracranial abnormalities. Association between initial presenting symptoms and additional MRI findings were examined by calculating odds ratio using 95% confidence interval.

RESULTS

Of the 151, 67 met our inclusion criteria. The mean age was 6.8 months (+/- 7.4 months) and the mean initial GCS score was 14.6 (+/- 0.6). The most common initial presenting symptoms and findings were retinal hemorrhage (39%) and vomiting (33%). The most frequent additional MRI findings not seen on CT were subdural hemorrhage (39%), ischemia/infarction (27%), subarachnoid hemorrhage (29%) and atrophy (27%). Statistically significant associations were found between the initial presenting symptoms of seizure, and additional MRI findings of ischemia/infarct and SDH.

CONCLUSION

Compared to CT, MRI provides clinically useful data in children less than 3 years of age with NAT/mTBI, particularly with evidence of ischemia/infarction. Although children in our study presented with mild symptoms and GCS scores of 13-15, the association between the additional MRI findings and the initial presenting symptoms may help in creating an algorithm to determine when a child must have an additional MRI examination. This will, in turn, help in reducing or even preventing long term risk of neurodevelopmental disabilities following mTBI/NAT.

CLINICAL RELEVANCE/APPLICATION

Association between the child's initial presenting symptoms and subsequent additional MRI findings can help predicting if a child must have an MRI prior to discharge from the hospital.

SSE21-02 • A Multimodal Imaging Approach to the Super-acute Phase of Mild Traumatic Brain Injury: A Pilot Study

Lidia M Nagae MD (Presenter) ; William C Gaetz PhD ; Mark Zonfrillo MD, MSc ; Jeffrey Berman PhD * ; Kory Heiken ; Erin S Schwartz MD ; Timothy Roberts PhD *

PURPOSE

There has been emerging interest in the acute phase of mild traumatic brain injury (mTBI), with the possibility of early medical intervention targeting presumed underlying metabolic dysfunction. The purpose of our study is to perform a pilot study of multimodal advanced imaging, including gamma-aminobutyric acid MR spectroscopy (GABA-MRS), diffusion tensor imaging (DTI), quantitative arterial spin labeled perfusion imaging (ASL), and magnetoencephalography (MEG), to evaluate super-acute phase of MTBI.

METHOD AND MATERIALS

Subjects in the super-acute phase of MTBI (first 96 hours of injury) and controls between 14-18 years of age were recruited. Subjects and controls with normal clinical routine MRI (including diffusion, susceptibility, and qualitative evaluation of ASL perfusion) were evaluated at a 3.0 Tesla scanner, utilizing a multimodality approach including GABA-MRS (left precentral gyrus area, bi-frontal, and bi-occipital regions), DTI, ASL, and MEG. Only subjects with normal clinical MRI sequences were included.

RESULTS

Seven patients with mTBI and 5 controls were evaluated. Overall, on MEG, significant increase in delta and theta activity z-scores was found in the left superior frontal gyrus and bilateral amygdala. The modalities were compared in similar anatomic regions, in an attempt to reproduce the same areas interrogated by GABA-MRS, utilizing t measurements. In the left motor region, a trend was seen for decrease in ADC (p

CONCLUSION

These preliminary results demonstrate the feasibility of our multimodal evaluation of super-acute mTBI. Comparison with MEG is suggestive of functional changes in similar anatomical areas in patients, despite the mechanism of injury, which could be speculated as a potential diffuse reaction of the brain to trauma.

CLINICAL RELEVANCE/APPLICATION

Early identification of possible injury by any of the imaging modalities utilized could aid as objective identification of mTBI, and serve as a potential tool for follow-up if medical intervention.

SSE21-03 • MRI Features of Cortical Venous Injury in Abusive Head Trauma (AHT)

Arabinda K Choudhary MBBS (Presenter) * ; **Krishnamoorthy Thamburaj** MD ; **Mark Dias** MD ; **Danielle K Boal** MD

PURPOSE

1. To assess evidence of direct intracranial venous injury in AHT
2. To assess evidence of indirect features of intracranial venous injury in AHT
3. To assess for thrombosis of cortical veins and sinuses in AHT

METHOD AND MATERIALS

We identified patients between 0-3 years with AHT managed at our institute from 2001-2012. MRI and MRV were evaluated by two experienced neuroradiologists to assess for subdural hemorrhage, parenchymal abnormalities and thrombosis. Detailed evaluation of veins and sinuses included evidence of direct venous injury with blood clot adherent to the bridging cortical veins (Lollipop sign) terminating in the region of subdural hemorrhage, secondary features of venous injury with compression (compression sign) of cortical veins by the subdural hemorrhage.

RESULTS

A total of 45 studies were reviewed. The median age was 3 months with 62% males. 41/45 children (91%) had SDH. On MRV, 14/45 cases (31%) had no evidence of venous compression, including 10 with, and 4 without SDH. The remaining 31/45 cases (69%) had imaging evidence of cortical vein and/or sinus compression. Venous compression was most commonly bilateral in 45%. In 17/31 cases (54.8%) only the cortical veins were compressed whereas in 11/31 cases (35.5%) both cortical veins and sinuses were compressed. In 3/31 cases (9.7%) only the sinus was compressed.

Evidence of direct trauma to the bridging vein (lollipop sign) was seen in 44.5% of cases. All veins having a lollipop sign also had evidence of venous compression from an overlying SDH. Among 22/41 children with a small volume SDH, 15/22 (68.2%) had evidence of venous compression and 10/22 (45.4%) had a lollipop sign. Among 19 cases of moderate or large SDH, 16/19 (84.2%) had evidence of venous compression and 10/19 (52.6%) had a lollipop sign (table 1). The four remaining children without SDH had neither venous compression nor a lollipop sign. Thrombosis was found in 2/45 cases of AHT.

CONCLUSION

1. Evidence of displacement and/or compression of cortical veins and sinuses from subdural hemorrhage is present in 69% of cases of AHT.
2. Evidence of direct trauma to the veins can be identified in 44.5% of cases.
3. There were no cases of cortical vein compression or lollipop sign in absence of subdural hemorrhage.

CLINICAL RELEVANCE/APPLICATION

Our study will increase awareness and subsequently improve detection of MRV findings of compression and evidence of direct trauma to the bridging veins.

SSE21-04 • A Diffusion Tensor Imaging (DTI) Study of Brain White Matter and Neuropsychiatric Abnormalities in Attention Deficit/Hyperactivity Disorder (ADHD) Children

Lizhou Chen (Presenter) ; **Xinyu Hu** ; **Yi Liao** ; **Lanting Guo** ; **Qiyong Gong** ; **Xiaoqi Huang** MD ; **Ning He** ; **Fei Li** MD

PURPOSE

ADHD is highly prevalent in school-age children with impaired cognitive functions. Diffusion tensor imaging (DTI) owns a unique advantage of detecting microstructural changes in cerebral white matter and might be useful to detect cognitive abnormalities in ADHD. In present study, we aim to examine the whole-brain fractional anisotropy (FA) difference between drug-naïve ADHD children and healthy controls (HC) in a relatively large sample size and also to explore the correlation of FA value with neuropsychiatric measurements.

METHOD AND MATERIALS

47 ADHD children (mean age=10.1, male=41) and 48 HC (mean age=10.9, male=35) were recruited. All participants underwent a set of neuropsychological tests including Stroop test (ST), visual memory test (VMT), verbal fluency test (VFT) and Wisconsin Card Sorting test (WCST). The DTI measures were acquired via 3-T MR system using EPI sequence with 20 directions. FA map was generated by FSL after eddy current and brain extraction, and put into SPM8 for normalizing and smoothing. Voxel-wise comparison was done by two sample t-test with age and sex as covariates, threshold at P

RESULTS

Comparing with HC, the ADHD group demonstrated increased FA in the body of corpus callosum extending to bilateral middle cingulum (peak coordinates [-12, 2, 38], $T=4.27$) (see Figure), while no decreasing cluster was detected. The cluster displayed a positive correlation with VMT scores for 30-minutes delay intervals ($r=0.32$, $p=0.029$), VFT scores for total numbers ($r=0.46$, $p=0.001$) and right numbers ($r=0.45$, $p=0.001$), ST scores for right numbers ($r=0.31$, $p=0.032$), while negatively correlated with ST scores for wrong numbers ($r=-0.32$, $p=0.028$) and total time ($r=-0.37$, $p=0.01$).

CONCLUSION

Our study found elevated FA value in the group of ADHD children which correlated with multiple cognitive functions. We postulated there might be a compensatory mechanism for increased information translation between hemispheres in ADHD children.

CLINICAL RELEVANCE/APPLICATION

Diffusion tensor imaging (DTI) may be a useful technique to help with the evaluation of cognitive abnormalities in ADHD children.

SSE21-05 • ¹H Magnetic Resonance Spectroscopy Assessment of Metabolic Brain Maturation in Attention Deficit Hyperactivity Disorder

Arturo R Alvarado MD (Presenter)

PURPOSE

To evaluate aged-related biochemical changes in Frontal Lobe White Matter (FLWM) using ¹H Magnetic Resonance Spectroscopy (MRS) in children diagnosed as Predominantly Inattentive Type Attention Deficit Hyperactivity Disorder (ADHD).

METHOD AND MATERIALS

Forty right-handed male children (5 years old) diagnosed as ADHD according to the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV) criteria participated in the study after their parents' consent and the Local Ethics Committee authorization was obtained. Psychological/behavioral treatment was performed during the course of the investigation avoiding medications' use. MRS studies were performed on a 3.0 Tesla scanner (Signa Excite, GE) with a standard head coil using Point-Resolved Spectroscopy (PRESS) localization with automated shim and water suppression. Parameters were fixed at TR= 1500 ms, TE= 35 ms and 256 FID. T1, T2 and T2 FLAIR MR images in axial, coronal and sagittal views were acquired before MRS examination and single voxel of 4.00 cm³ (2.0 cm x 1.0 cm x 2.0 cm) was placed in each FLWM and Occipital WM used as internal reference pattern. All children were examined every 12 months in a date close to the birthday during 4 consecutive years. Metabolic signals of N-Acetylaspartate (NAA), Creatine (Cr), Choline (Cho), Glutamine-Glutamate complex (Glx) and myo-Inositol (mI) were detected and NAA/Cr, Cho/Cr, Glx/Cr and mI/Cr ratios were calculated. Analysis of Variance (ANOVA) was applied to the results. Student-Newman-Keuls test for multiple comparisons were assessed in order to verify the differences among ratio means. Analysis of Covariance (ANCOVA) was used to evaluate the relationship between the neuropsychological test scores and metabolites ratios result.

RESULTS

Significant age-dependent decreases in Glx/Cr ratio was observed in FLWM at both sides as well as in Cho/Cr ratio in right FLWM (p

CONCLUSION

These findings suggest that Glx/Cr and Cho/Cr ratios are increased in FLWM of children with ADHD and the age-dependent reduction might constitute a brain maturation marker in ADHD.

CLINICAL RELEVANCE/APPLICATION

The Glx/Cr and Cho/Cr age-dependent decrease evaluated through MRS might be useful as a complement of routine ADHD examinations. Therefore; we recommend its use on ADHD evaluation.

SSE21-06 • Medication Naïve Attention-deficit/Hyperactivity Disorder Subjects Have Low Brain Iron Levels as Detected by Magnetic Field Correlation Imaging

Vitria Adisetiyo PhD (Presenter) ; **Rachael Deardorff** MS ; **Ali Tabesh** PhD ; **Els Fieremans** PhD ; **Kevin M Gray** MD ; **Adriana Di Martino** ; **F. Xavier Castellanos** MD ; **Jens H Jensen** PhD ; **Joseph A Helpert** PhD *

PURPOSE

Stimulant medication reduces symptoms in attention-deficit/hyperactivity disorder (ADHD) through indirectly increasing dopamine (DA) levels in the striatum. Hence, it is suspected that reduced DA levels are part of ADHD pathology. However, both increased and decreased DA markers have been detected in ADHD. Interestingly, reduced DA markers have been consistently found in medication naïve patients while increased markers have been found in patients with a history of medication use, suggesting increased DA markers may reflect an adaptive response to medication. Here we assess the relationship between medication history and brain iron levels in children and adolescents with ADHD compared to typically developing controls (TDC). As brain iron is required for DA synthesis, assessing iron levels with MRI may provide non-invasive indirect measures of DA.

METHOD AND MATERIALS

27 TDC, 12 ADHD-naïve and 10 ADHD-medication were recruited. As indices of brain iron, magnetic field correlation (MFC) and relaxation rates (R2, R2* and R2') were used. All are affected by tissue iron but differ in their sensitivities and specificities. MFC was estimated with MFC imaging, R2 with a multiple spin echo sequence and R2* with a multiple gradient echo sequence. R2' = R2*- R2. The globus pallidus (GP), caudate nucleus (CN), putamen (PUT) and thalamus (THL) were chosen as regions of interest because of their suspected role in ADHD in addition to having high iron content. Serum iron measures were also collected.

RESULTS

The ADHD-naïve subgroup had significantly lower MFC than either TDC or the ADHD-medication subgroup in 3 of the 4 brain regions studied (FDR corrected). ADHD-naïve vs. TDC: PUT (p = 0.005, d = 1.0), CN (p = 0.003, d = 1.1) and THL (p = 0.012, r = 0.4); ADHD-naïve vs. ADHD-medication: PUT (p = 0.002, d = 1.5), CN (p = 0.004, d = 1.4) and THL (p = 0.021, r = 0.5). TDC and the ADHD-medication subgroup did not significantly differ in MFC. In contrast, no significant group differences were detected using the R2, R2*, R2' or serum measures.

CONCLUSION

Similar to other DA marker measures, lower brain iron levels (indexed only by MFC) are observed in medication naïve ADHD and appear to normalize with medication.

CLINICAL RELEVANCE/APPLICATION

Reduced brain iron in medication naïve ADHD is a promising biomarker. MFC imaging's ability to non-invasively detect these aberrant levels may help improve ADHD diagnosis and guide optimal treatment.

Emergency Radiology Series: Leveraging Technology for State-of-the-Art Practice

Tuesday, 08:30 AM - 12:00 PM • E352



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VSER31 • AMA PRA Category 1 Credit™:3.75 • ARRT Category A+ Credit:4

Moderator

Suzanne T Chong, MD

Moderator

Savvas Nicolaou, MD

VSER31-01 • Information Technology Solutions for Managing Emergency Radiology

Robert A Novelline MD (Presenter)

LEARNING OBJECTIVES

1) Learners will be able to introduce technology solutions for improving the management of Emergency Radiology facilities. 2) Learners will be able to identify technologies for optimizing Emergency Radiology patient scheduling, procedure protocoling, routine reporting, managing important and urgent communications, expediting workflow and satisfying requirements for peer review.

VSER31-02 • Is the Teleradiology Consultation Using a Smartphone with Mobile PACS Helpful When an On-call Radiology Resident Is Not Confident about the Presence of Appendicitis?

Nak Jong Seong MD (Presenter) ; **Bohyoung Kim** PhD ; **Kyoung Ho Lee** MD ; **Seung Chan Lee** MD

PURPOSE

To discover whether the teleradiology consultation using a smartphone with mobile PACS (Picture Archiving and Communication System) can improve diagnostic performance of preoperative CT when an on-call radiology resident cannot make confident CT interpretation in regard to the presence of acute appendicitis

METHOD AND MATERIALS

From a previous randomized controlled trials associating with the acute appendicitis, we collected 68 patients' CT scans for which on-call radiologists scored the presence of acute appendicitis as grades 2, 3, and 4 in the 5-grade Likert scale. Two off-site abdominal radiologists retrospectively interpreted CT scans with suspected appendicitis, using iPhone 4 and a commercially available mobile PACS under a wireless network. Inter-observer agreement was measured using kappa statistics for two iPhone readers. Regarding the diagnosis of acute appendicitis as the reference standard, receiver operating characteristic (ROC) analysis was performed to compare the diagnostic performance of four readers: on-call radiologist, in-house attending abdominal radiologist, and two iPhone readers. The confidence grades for the presence of acute appendicitis were compared among four readers by using the Wilcoxon signed rank test for appendicitis and non-appendicitis cases, respectively, along with the heat maps combined with a dendrogram

RESULTS

The kappa statistic for the two iPhone readers was 0.90. The areas under the curve (AUCs) of two iPhone readers (AUC=0.97, 0.91) tended to be higher than that of on-call radiologist (AUC=0.85). For the appendicitis (or non-appendicitis) case, the in-house attending radiologist and two iPhone readers showed significantly higher (or lower) grades for the presence of acute appendicitis than on-call radiologist (P

CONCLUSION

Teleradiology consultation using a smartphone with mobile PACS is acceptable in the diagnosis of inconflident acute appendicitis by on-call radiologist.

CLINICAL RELEVANCE/APPLICATION

Smartphone reading using a mobile PACS could be helpful as a teleradiology consultation in the diagnosis of acute appendicitis, especially inconflident CT reading by on-call radiologist.

VSER31-03 • Value of Automated 3D-rendering and Rib Labeling for Evaluation of Rib Fractures in Whole-body CT Data Sets of Polytrauma Patients - Preliminary Results

Stefan Puig MD, MSc (Presenter) ; Daniel Ott MD ; Jennifer L Cullmann ; Tomas Dobrocky MD ; Johannes T Heverhagen MD, PhD * ; Hendrik Von Tengge-Kobligk MD *

PURPOSE

Aim was to evaluate accuracy and efficiency of a new CT image processing tool, which enables an automated 3D-rendering of whole body CT data sets including an unfolded display of the rib cage and the spine as well as an automated rib and spine labeling.

METHOD AND MATERIALS

Two readers (senior physicians) independently evaluated randomly selected whole-body-CTs of polytrauma patients for rib fractures. All CTs have been performed with a 128-slice-scanner. Axial reconstructions (slice-thickness: 1mm) were used as primary data to be retrospectively analyzed with the syngo.CT Bone-Reading client (syngo.via VA 20; Siemens, Germany). We evaluated numbers and location of fractures and compared the results with previously written reports. A final consensus read served as reference standard for rib fractures. Accuracy of the rib and spine labeling was recorded. In addition, time for reading was measured. Reader satisfaction with the software client was assessed using a 4-point Likert scale (1 = very useful for reporting; 2 = useful; 3 = undetermined; 4 = impedes reporting).

RESULTS

Up to now, 15 whole-body-CT-scans from 15 patients (mean age = 55.3 years; range 21 - 84 years) have been included in the analysis. 6/15 (40.0%) patients had rib fractures, 4/6 (16.67%) showed multiple fractures. Based on patients with rib fractures, sensitivity for reader 1 and reader 2 was 83.3% (5/6) and 100%, respectively. A non-displaced fracture of the first rib was detected by only one reader. According to the prior written reports 4/6 (66.67%) patients were reported as positive for rib fracture based on conventional reading. Time for reading was 2min 38s and 2min 20s, respectively. In 7/15 (46.7%) rib and spine segmentation as well as labeling was correct. Reasons for incorrect segmentation and/or labeling were: congenital anomaly (n=1), severe kyphosis (n=1), no segmentation of first rib (n=5). Both readers rated the software client as useful for reporting (mean rating: 1.8 and 1.6). In no case the software client was rated as to interfere with reporting.

CONCLUSION

Using the syngo.CT Bone-Reading client we could achieve a higher detection rate of rib fractures compared to conventional reading in a relatively short reading time.

CLINICAL RELEVANCE/APPLICATION

Automated 3D-rendering of whole body CTs allows a time-saving evaluation of the ribs and spine and enables a higher detection rate of rib fractures than conventional reading in polytrauma patients.

VSER31-04 • Enhancing Your CT Practice with Dual Energy in the ER

Aaron D Sodickson MD, PhD (Presenter)

LEARNING OBJECTIVES

1) Summarize key concepts of dual energy CT. 2) Describe protocol building, workflow and postprocessing of dual energy scanning. 3) Highlight a variety of game-changing dual energy applications for emergency radiology practice that have the potential to enhance information content, reduce radiation dose, or both.

VSER31-05 • Use of Dual-energy CT and Virtual Non-calcium Techniques to Evaluate the Time to Resolution of MRI-proven Bone Bruises

Song-Tao Ai ; Mingliang Qu MD (Presenter) ; Katrina N Glazebrook MBChB ; Peter Rhee DO ; Shuai Leng PhD ; Maria Shiung ; Cynthia H McCollough PhD *

PURPOSE

The purpose of this study was to investigate the short-term status of post-traumatic bone bruises using dual-energy CT (DECT) and virtual non-calcium (VNCa) techniques in a cohort of patients with MRI-proven bone bruising lesions subsequent to unilateral knee injury.

METHOD AND MATERIALS

Patients with unilateral knee injury occurring between March 2009 and July 2011 resulting in bone bruises confirmed by MRI and who had bilateral DECT scanning of the knee performed within six months of the injury were identified from chart review. DECT examinations were performed using a clinical protocol. Two radiologists evaluated VNCa images without knowledge of MRI results for the presence of increased soft tissue attenuation in four anatomic regions, and DECT findings were compared to the prior MRI and contralateral DECT images.

RESULTS

14 patients with MRI-proven bone bruises were identified by chart review to have undergone DECT subsequent to the MRI exam, with a total of 36 out of 56 (64%) lesion-positive anatomical regions by MRI. DECT detected lesions in 10 out of 14 patients (71%) and identified 22 out of the 36 (61%) lesion-positive regions identified by MRI. The mean CT numbers in VNCa images for positive and negative bone bruising regions were -7.6 ± 24.9 HU (22 regions) and -58.2 ± 19.5 HU (34 regions) (p-value < 0.001), respectively. The number of days between injury and DECT ranged 11 to 99. At 2, 4, 6, and 8 weeks post-injury, 14 (38.9%), 18 (50.0%), 23 (63.9%) and 34 (94.4%) lesion-positive regions by MRI were negative by DECT, respectively.

CONCLUSION

This study confirmed the feasibility of using DECT and a VNCa technique to evaluate the short-term status of post-traumatic bone bruises and found that over 90% of MRI-proven bone bruise regions had resolved by 8 weeks post-injury.

CLINICAL RELEVANCE/APPLICATION

DECT exam provided reliable assessment of the presence or absence of bone bruising and allowed assessment of the time to resolution of bone bruising in this small patient cohort.

VSER31-06 • Lung Perfused Blood Volume (Lung PBV) Imaging on Dual-energy CT: Quantitative Capability for Disease Severity Assessment in Patients with Acute Pulmonary Thromboembolism

Sachiko Miura MD (Presenter) ; Yoshiharu Ohno MD, PhD * ; Yuko Nishimoto MD ; Kimihiko Kichikawa MD

PURPOSE

To determine the capability of lung perfused blood volume (PBV) imaging on dual-energy CT (DECT) for disease severity assessment in acute pulmonary thromboembolism (APTE) patients.

METHOD AND MATERIALS

Twenty-one consecutive APTE patients underwent contrast-enhanced DECT and echocardiography at the onset. A normalized lung PBV (nLung PBV) image was generated by pixel analysis in each patient. In each patient, the overall perfusion (OP) and heterogeneity (H) indexes were assessed as averages of mean and standard deviation of the nLung PBV value within ROIs placed over each lung field in both lungs. In this study, the disease severity of APTE was determined as CT angiographic clot burden score (CBS) according to past literatures and tricuspid regurgitation pressure gradient (?P). Then, all patients were divided into right heart (n=13) and non-right heart (n=8) dysfunction groups. To determine the capability of DECT indexes for disease severity assessment, CBS and ?P were statistically correlated with both DECT indexes. To assess difference of each index between the two groups, all indexes were compared by Student's t-test. To determine the capability for differentiating the two groups, feasible threshold values of CBS and the DECT indexes as having significant differences between the two groups were determined using ROC-based positive test. Finally, sensitivity, specificity and accuracy were compared to each other by using McNemar's test.

RESULTS

CBS had significant correlation with OP index ($r=-0.82$, p

CONCLUSION

The Lung PBV imaging on DECT has a potential for disease severity assessment in APTE patients, and it is considered at least as valuable as clot burden score in routine clinical practice.

CLINICAL RELEVANCE/APPLICATION

The Lung PBV imaging on DECT has a potential for disease severity assessment in APTE patients, and it is considered at least as valuable as clot burden score in routine clinical practice.

VSER31-07 • Comparison of the Image Quality between Virtual Non Contrast Scans Obtained on Solid State Detectors and on the New Fully Integrated Digital Chip Detector that were Generated from Abdominal Dual Energy CT Exams in the Emergency Department

Adrian Reagan MD (Presenter) ; Patrick McLaughlin FFRCSEI ; Savvas Nicolaou MD ; Luck J Louis MD ; Ana-Maria Bilawich MD ; Sharon Gershony MD

PURPOSE

To determine the effect on noise reduction in VNC studies generated on solid state detector (SSD) and on the new fully integrated digital chip detector (FICD) and to determine whether virtual non contrast images provide similar quality to standard NC studies with the aim of eliminating the need for NC scans effectively reducing radiation dose in the acute setting.

METHOD AND MATERIALS

10 DECT studies were imaged on the SSDs and 10 on the new FICD using the 128 slice DS Definition scanner. Protocol parameters included: 64 by 0.6 mm col. reconstructed to 1.5mm axial DE 100 and 140 kv tin filter data sets. D30 1.5 mm axial DECT images were loaded into the multimodality station within the liver VNC DE application class. 3mm axial VNC images were exported to pacs for analysis. Routine NCIs were obtained using 64 by 0.6 mm col., reconstructed to a thickness of 3mm axial slices using B30 kernel keeping CTDI vol the same as the DECT protocol. Noise was calculated via SD of ROIs in 5 tissues. Two Radiologists graded the quality of the NC and VNC image sets using a 5-point Likert scale. SNR was then averaged and the means were compared between the VNC data set imaged on the SSD and the VNC data set imaged on the new FICD. Analysis between VNC images and standard NC studies obtained on the FICD was also performed. A Mann-Whitney U test was used to compare the level of noise between VNC images done on SSD and VNC images done on the FICD. VNC images obtained on the FICDs were also compared with regular NCIs from the same detector. VNCIs performed on the FICD revealed a U value of 25 ($p < 0.05$). The new VNC data when compared to the regular NC data obtained on the FICD revealed a U-value of 40 ($p > 0.05$).

RESULTS

VNC images obtained on the FICD demonstrated lower noise values compared to VNC data sets obtained on the SSD. No difference in noise values was found between the standard NC studies and the new VNC images. Subjectively VNC abdomen sets provided equal diagnostic quality compared to standard NC studies.

CONCLUSION

Findings suggest VNC image noise levels are reduced on the new FICDs. New VNC studies provide diagnostic images comparable to standard NC protocols.

CLINICAL RELEVANCE/APPLICATION

The new FICDs resulted in diagnostic VNC studies and thus represent a future dose reduction strategy in the elimination of non contrast studies in abdominal ED protocols.

VSER31-08 • QandA/Break

VSER31-09 • Multi-detector CT: One Stop Shop for the Assessment of Acute Chest Pain

Savvas Nicolaou MD (Presenter)

LEARNING OBJECTIVES

1) Discuss diagnostic imaging algorithm for the assessment of acute chest pain. 2) Discuss the benefits and Limitations of cardiac CT in the acute setting. 3) Review the optimization of the Cardiac CT in the emergency department. 4) Assess literature evidence of MDCT in diagnosis of acute coronary syndrome (ACS) with regards to cost, time to diagnosis and outcomes. 5) Discuss the role of a Triple-Rule-Out Protocol in evaluation of acute chest pain. 6) Discuss the characteristics of coronary lesions on MDCT that are associated with ACS. 7) Review new dose reduction techniques which maintain diagnostic quality available including prospective ECG gating, BMI-based tube voltage reduction and iterative reconstruction.

ABSTRACT

Chest pain is a very common presentation in the emergency department (ED), accounting up to 5.8 million visits a year and as the second leading complain in the ED. It is important to properly diagnose acute coronary syndrome (ACS) in these patients; 2-8% of patients with ACS are misdiagnosed and inappropriately discharged home which has been demonstrated to be associated with a doubling of mortality rate. It is vital to differentiate ACS from other serious causes of chest pain including pulmonary embolism and aortic dissection. Multidetector CT (MDCT) has been proposed to be an one-stop shop as it allows quicker time, low costs, and easy access, the ability to rule out ACS confidently using non-invasive visualization, and visualization of extracardiac findings.

VSER31-10 • Are Cardiac Risk Factors and Risk Scores Useful to Triage Patients Presenting to the Emergency Department with Chest Pain among Those Judged to Be at Low to Intermediate Risk of Acute Coronary Syndrome?

Jacob P Deutsch ; Maria M Hannaway ; Adrian T Estepa ; Anand I Kenia ; David C Levin MD * ; Ethan J Halpern MD (Presenter)

PURPOSE

To evaluate the predictive value of cardiac risk factors and risk scores for coronary artery disease (CAD) and adverse outcomes in an emergency department (ED) population judged to be at low to intermediate risk for acute coronary syndrome (ACS).

METHOD AND MATERIALS

IRB approval was obtained for this HIPAA compliant, prospective cohort study. The study cohort included consecutive patients who presented to the ED with chest pain over a 36 month period, were admitted to the observation unit, evaluated with coronary CTA (cCTA) and agreed to provide written informed consent. Cardiac risk factors, clinical presentation, ECG and laboratory studies were recorded with a standard template; TIMI and GRACE scores were tabulated. cCTA findings were reviewed by two experienced cardiac radiologists, rated on a 6 level plaque burden scale, and classified for presence/absence of significant CAD (stenosis = 50%). Adverse cardiovascular

outcomes were recorded after 30 days.

RESULTS

Among 250 patients evaluated by cCTA, 143 (57%) had no CAD, 64 (26%) demonstrated minimal plaque (70% stenosis). Six patients developed adverse cardiovascular outcomes. Among traditional cardiac risk factors, only age (older) and sex (male) were significant independent predictors of CAD. Correlation with CAD was poor for TIMI ($r=0.12$) and GRACE ($r=0.09-0.23$) risk scores. Although risk factors, patient presentation, and risk scores were poor predictors of CAD and adverse outcomes, cCTA identified severe CAD in all subjects with adverse outcomes.

CONCLUSION

Among patients who present to the ED with chest pain and are judged to be at low to intermediate risk of ACS, traditional risk factors, TIMI and GRACE scores are not useful to stratify patient risk for CAD and adverse outcomes. cCTA is an excellent predictor of outcome.

CLINICAL RELEVANCE/APPLICATION

Coronary CTA is superior to traditional risk factors for triage of patients presenting to the ED with chest pain and who are judged to be at low to intermediate risk of acute coronary syndrome.

VSER31-11 • MRI in Abdominal Emergencies

Stephan W Anderson MD (Presenter)

LEARNING OBJECTIVES

1) To understand the appropriate use of MRI in the abdominal emergency setting. 2) To discuss the protocol considerations for maximizing the diagnostic yield of MRI in imaging abdominal emergencies. 3) To illustrate relevant imaging findings for a range of abdominal emergencies to which MRI may be appropriately applied.

VSER31-12 • Efficacy of MR Sequences in the Optimal Visualization of the Appendix

Ajay K Singh MD (Presenter) ; **Garry Choy MD, MS** ; **Mukesh G Harisinghani MD**

PURPOSE

The aim of this study was to determine the frequency of visualization of appendix on different MR sequences.

METHOD AND MATERIALS

The MR sequences obtained in 61 patients for the evaluation of pelvis and right lower quadrant were included in this study. Two board certified radiologists independently evaluated the different MR sequences for the visualization of the appendix. The frequency of visualization of the normal or abnormal appendix was documented for single shot fast spin-echo (SSFSE), T2 fast spin echo (FSE), T1 weighted gradient-echo (GRE) and inversion recovery sequences (STIR).

RESULTS

SSFSE without fat saturation in 3 planes was able to visualize the appendix in 90.9% of the cases (50/55). Amongst the 3 planes (axial, coronal and sagittal) of image acquisition with SSFSE, the coronal image acquisition was considered to be the best in the visualization of the appendix, followed by acquisition in axial plane. The frequency of visualization of appendix on T2 FSE sequences was 62.5% (10/16) without fat saturation and 26.6% (4/15) with fat saturation. In phase T1-weighted GRE (39.2%) sequence was found to be more likely to visualize the normal appendix, compared to out of phase T1-weighted GRE sequence (12.5%). Of the MR sequences evaluated in this study short tau inversion recovery (8.3%) and fat saturated SSFSE (4.7%) sequences were least likely to visualize the appendix.

CONCLUSION

All imaging protocols in patient with suspected appendicitis should include 3 planes SSFSE without fat saturation, T2 FSE sequence without fat saturation and T1 in-phase sequence. Fat saturated SSFSE, STIR and T2 FSE sequences are least effective in visualization of the normal appendix.

CLINICAL RELEVANCE/APPLICATION

This study allows a radiologist to choose the most optimal sequences in the visualization of the appendix in patients with suspected acute appendicitis.

VSER31-13 • Diagnostic Performance of Noncontrast Abdominopelvic MRI for the Evaluation of Suspected Acute Appendicitis in Patients < 40 Years Old

Matthew Covington MD (Presenter) ; **Shannon Urbina** ; **Lori Stolz MD** ; **Diego R Martin MD, PhD** ; **Dorothy L Gilbertson-Dahdal MD** ; **Sarah M Desoky MD** ; **Hina Arif** ; **Bobby T Kalb MD**

PURPOSE

Evaluate the sensitivity and specificity of MRI for the detection of acute appendicitis in patients = 40 years old presenting to the ED with right lower quadrant pain

METHOD AND MATERIALS

Study was IRB-approved, HIPPA compliant. Inclusion criteria selected total of 59 patients = 40 years old presenting to emergency room with possible acute appendicitis and evaluated with MRI as the primary imaging test between 8-2012 and 3-2013. Exclusion criteria excluded patients > 40 years old and patients without symptoms of acute appendicitis. All MR exams were performed with a fast, no oral/no intravenous contrast protocol, utilizing a combination of multiplanar, non-breath-hold, T2-weighted HASTE sequences without and with spectral adiabatic inversion recovery (SPAIR) fat suppression. The acquisition time for each exam was recorded. The MRI was interpreted the same day in a prospective fashion by the radiologist assigned to the clinical service that day. The results were classified as a) positive, b) negative or c) indeterminate for acute appendicitis. MRI results were also categorized for additional pathology or sources of pain. Each patient was followed up by either a) surgical findings or b) phone call follow-up at 1 week and 6 months after the ED visit and interrogation of medical records for subsequent clinical work-up. Statistical analysis included calculation of sensitivity, specificity, positive and negative predictive values.

RESULTS

59 patients received MRI for evaluation of right lower quadrant pain and 5 exams were positive for acute appendicitis (8.5%). When compared with gold standards of surgery (5/59) and phone call follow-up with medical records review (54/59), MRI demonstrated a sensitivity of 100%, specificity of 100%, negative predictive value of 100% and positive predictive value of 100%. Out of the 54 patients with negative MRI for acute appendicitis, an alternate diagnosis was offered in 22/54 (40.7%). The average exam time for each MRI was 15 minutes (range 12-22 minutes).

CONCLUSION

MRI is a highly accurate test for the diagnosis of acute appendicitis in patients = 40 years old, with sensitivity and specificity of 100% in our study, utilizing a rapid imaging protocol without oral or IV contrast.

CLINICAL RELEVANCE/APPLICATION

MRI is highly accurate for diagnosing acute appendicitis in patients = 40 years old, providing a rapid, non-radiation based exam for evaluation of right lower quadrant pain in the emergency setting.

VSER31-14 • Panel/QandA

ER

LL-ERS-TUA • AMA PRA Category 1 Credit™:0.5

Host
Garry Choy, MD, MS

LL-ERS-TU1A • Trends in MDCT Utilization and Its Impact on Radiation Dose for Diagnosis of Urolithiasis in an Emergency Setting

Surabhi Bajpai MBBS, DMRD (Presenter) ; Brian H Eisner MD ; Garry Choy MD, MS ; Dushyant V Sahani MD

PURPOSE

We investigated the MDCT utilization trends in the emergency department in patients being suspected of having urolithiasis and its impact on CT radiation dose exposure.

METHOD AND MATERIALS

In this IRB approved study, we reviewed consecutive unenhanced abdomen MDCT scans performed between Jan 2007 to Dec 2011 for urolithiasis in an emergency setting. Of the total 8378 unenhanced abdomen MDCT scans, studies for urolithiasis indications accounted in 4354 patients (51.96%). The medical records and CT images were reviewed for patient demographics, diagnostic yield and radiation dose. The dose measurements were compared to evaluate the impact on CT dose with the introduction of dose reduction strategies.

RESULTS

There was 6%/year reduction in abdomen MDCT scan volume between 2007 and 2011 (1722 vs 1619) with a greater reduction in scans for diagnosis of suspected urolithiasis (18% reduction, 947 vs 775). The reasons for decreased MDCT utilization included awareness of radiation risks and increasing use of ultrasound for stone diagnosis. The yield of MDCT for stone diagnosis was 55.4% with alternate diagnosis made in 4.2%. The most common alternate diagnosis was diverticulitis (0.7%) and appendicitis (0.4%). There was a substantial reduction in radiation dose exposure in patients

CONCLUSION

CT is a very important imaging tool in stone diagnosis and also provides an alternate diagnosis in patients presenting with renal colic. There has been a reduction in the MDCT utilization in an emergency setting in the past 5 yrs with substantial reduction in the utilization of MDCT scans for diagnosis of urolithiasis. This trend reflects the increasing awareness of radiation dose associated with MDCT scans. However, continued efforts need to be made for coming up with strategies in radiation dose reduction.

CLINICAL RELEVANCE/APPLICATION

Increasing radiation dose exposure concerns has resulted in decreased MDCT utilization in an emergency setting particularly in patients with urolithiasis.

LL-ERS-TU2A • Changes in Ordering of Radiological Studies Since the Implementation of 24 Hour in-house Attending Radiologist Coverage Overnight in the ER

Samuel Nirmalnath MD (Presenter) ; J. Michael Zerlin MD

PURPOSE

The purpose of this study is determine what influence 24 hour in-house attending coverage has had in the overnight volume and types of studies ordered in the ER in three large academic hospitals.

METHOD AND MATERIALS

Three large hospitals within the Detroit Medical Center campus (Detroit Receiving Hospital, Harper Hospital, and Sinai Grace Hospital) were analyzed. All imaging studies that were ordered from the Emergency Rooms between 12am to 7am during June and December of 2011 (before implementation of 24 hour in-house attending radiologist coverage) and June and December of 2012 (after implementation) were included.

RESULTS

A 21% increase was noted in the total amount of studies ordered overnight in the ER since the implementation of 24 hour in-house attending coverage without a significant change in the total ER visits during the months analyzed.

CONCLUSION

Since the implementation of 24 hour in-house attending coverage, a disproportionate increase in overnight volume as well as more advanced studies has been ordered through the ER when compared to the total ER visits. Reasons for this increase could be due to diagnostic imaging trends as well as the perceived availability of the radiology department. Further inquiry into resident impact, ER decision making, as well as patient outcome should be further investigated.

CLINICAL RELEVANCE/APPLICATION

Increasing after hours imaging and demand for rapid report turn around are challenging in an era of decreasing reimbursement.

LL-ERS-TU3A • Usefulness of Cervical Spine Radiographs in the Evaluation of Acute Cervical Spine Trauma

Brian Haas MD (Presenter) ; Lewis Hahn ; Isabel B Oliva MD

PURPOSE

Plain radiography of the cervical spine is used as a screening test for trauma patients at low risk for fracture. The lateral projection provides valuable information about vertebral alignment and aids in detection of unstable injuries. There is little agreement on the utility of performing AP, odontoid, and oblique views, and institutional protocols vary widely. As well, most research on cervical radiography was performed prior to the widespread use of CT for evaluation of patients in the emergency setting. We aim to evaluate the diagnostic yield of performing these views in addition to the lateral view in the modern era where radiographs are performed only on low risk patients.

METHOD AND MATERIALS

In this IRB approved, HIPAA complaint study, we reviewed the records of all patients aged 19 years and older who received cervical spine radiographs in the emergency room of a tertiary medical center between November 22, 2003 and January 17, 2012. After review of the lateral projection by a radiologist, the technologist proceeded to obtain AP, odontoid, and bilateral oblique views. If the lateral radiograph was abnormal or unsatisfactory CT was performed. Exam reports and images were reviewed to determine which patients had fractures and on which view they were identified.

RESULTS

Six fractures were detected in 7218 exams. Three of these fractures were identified on the lateral radiograph, and three of these fractures were found on the additional views. The yield of these additional views is 1 fracture per 9470 radiographic views (95% confidence interval of 0 to 3 per 10,000 views). These additional fractures were identified on the odontoid view in one case and the oblique views in two cases. For two of the patients with fractures identified on the lateral view, an additional fracture was found on the subsequent CT.

CONCLUSION

Performing additional views of the cervical spine including AP, odontoid, and bilateral oblique projections in trauma patients with low

pretest probability of fracture augments the diagnostic yield of lateral radiographs. Collectively, inclusion of the AP, odontoid, and bilateral oblique radiographs performed in conjunction with the lateral view doubled the sensitivity of the lateral view alone.

CLINICAL RELEVANCE/APPLICATION

Considering the potential for devastating neurological outcomes from missed cervical fractures, addition of AP, odontoid, and oblique views continues to detect fractures at a low rate.

LL-ERS-TU4A • Dual Energy CT in Acute Knee Trauma: Correlation with MRI and Surgical Findings

Paul I Mallinson MBChB (Presenter) ; **Sharon Gershony** MD ; **Patrick McLaughlin** FFRRCSI ; **Savvas Nicolaou** MD ; **Peter L Munk** MD ; **Hugue A Ouellette** MD ; **Hong Chou** MBBS, FRCR ; **Clemens Reisinger** MD

PURPOSE

CT is a popular initial imaging modality for assessing the knee in acute trauma, to exclude and characterise bony injuries and aid pre-operative planning. Diagnostic information on osseous structures is superior, but soft tissue detail is limited. The advent of dual energy CT (DECT) has allowed additional information to be gathered regarding the morphology of collagen based structures in the soft tissue. In this study we evaluate the clinical value of this additional information by correlation with MRI and surgical findings.

METHOD AND MATERIALS

A double read of the DECT images of 35 sequential patients, who had suffered acute trauma of the knee was performed by 2 musculoskeletal radiologists. Findings were correlated with the conventional CT report and available MRI or surgical reports, to assess the accuracy of any apparent additional findings.

RESULTS

6 patients had relevant MRI or surgical reports. Within these cases: 2 ACL tears, 1 IT band avulsion and 1 meniscal flip diagnosed on DECT were proven. 1 PCL tear, a popliteus tear and fibulocolateral ligament tear were missed on DECT. 2 proven meniscal tears were seen but not accurately characterized (complex vs radial). 1 meniscal tear called on DECT was unproven. 1 meniscal tear was reported in wrong horn. 1 retinacula tear and a meniscal tear were over-called on DECT.

CONCLUSION

This preliminary study of DECT shows potential for the assessment the more macroscopic types of soft tissue injuries such as major tendon tears. Accuracy in assessment of smaller tears and collagen based structures was poor.

CLINICAL RELEVANCE/APPLICATION

Dual energy CT can demonstrate significant soft tissue injuries which cannot be seen on conventional CT, but accuracy for smaller structures and injuries is limited.

LL-ERE-TU5A • Imaging of Anorectal and Perineal Emergencies

Adam Schneider MD (Presenter) ; **Vijayanadh Ojili** MD

PURPOSE/AIM

1. To provide a brief review of various traumatic and non-traumatic anorectal and perineal emergencies.
2. To discuss the role of imaging in the accurate diagnosis and characterization of a broad spectrum of acute conditions involving the anorectal and perineal region.

CONTENT ORGANIZATION

1. Introduction and pertinent normal anatomy of the anorectal and perineal region
2. Epidemiology, pathophysiology and imaging findings of various traumatic and non-traumatic anorectal and perineal emergencies (anorectal foreign bodies, traumatic rectal perforation, perirectal/perianal abscess, Fournier's gangrene, perforated rectal ulcer, perforated anorectal malignancy etc.)
3. Role of imaging in optimal triage and management of these patients.

SUMMARY

A wide variety of traumatic and non-traumatic acute conditions affecting the anorectal and perineal region may present in the emergency setting. Cross-sectional imaging studies, especially MDCT provides superior anatomical and pathological information, correctly direct the attention to an acute process and facilitates patient management.

LL-ERE-TU6A • "Triple Rule-out CT Angiography? Three for the Price of One; A Review of Cardiac CT Angiography

Morris Hayim MD (Presenter) ; **Randy Yeh** MD ; **Michael Nguyen** MPH ; **Saravanan K Krishnamoorthy** MD ; **Akash D Shah** MD

PURPOSE/AIM

Accurate ED triage of chest pain is essential for safe and cost effective patient management. The high prevalence of chest pain accounted for 6,392,000 ED visits and 1,976,000 hospital admissions in 2006. With the advent of 64-128 slice multidetector CT, radiologists can now play a central role in the chest pain algorithm. Vascular pathology including acute myocardial infarction, pulmonary embolism, and aortic dissection can all present emergently with chest pain. Recently, coronary CTA in low to moderate risk patients has been proven safe and cost effective. Newer scanning parameters have also decreased the radiation dose to minimize stochastic risks.

CONTENT ORGANIZATION

- Triple-Rule-out CT Angiography (TRO) in chest pain evaluation
- Clinical Indications for TRO
- Overview of TRO technique, contrast timing, and image acquisition
- Image interpretation

1. Coronary Arteries
2. Aorta/Great vessels
3. Pulmonary Arteries
4. Extra-cardiac structures

- Utilization/cost-effectiveness
- Radiation exposure and risk

SUMMARY

Triple Rule Out CT Angiography has been gaining acceptance as a safe and effective method of evaluation of chest pain. Radiologists should be familiar with clinical indications of TRO, state of the art protocols with radiation-sensitive scanning parameters, and guidelines for image interpretation.

LL-ERE1186-TUA • Tricky Talus: A Radiologist's Guide to Timely Diagnosis and Classification of Talar Fractures and Dislocations

Robert A Mackey MD, MBA (Presenter) ; **Yulia Melenevsky** MD ; **Norman B Thomson** MD

PURPOSE/AIM

To provide radiologists with a high yield resource for identifying and differentiating between different types of talar injuries in order to facilitate proper management

CONTENT ORGANIZATION

1. General concepts: relevant anatomy, epidemiology and mechanisms of injury, imaging work up
2. Overview and classifications of talar injuries with discussion of management options:
 - Fractures: head, neck, body, dome, lateral and posterior processes
 - Dislocations

SUMMARY

Familiarity with the imaging findings is essential for timely diagnosis of talar injuries. Accurate delineation and classification of talar fractures and dislocations is necessary for guiding effective management decisions and optimizing treatment outcomes.

Emergency Radiology - Tuesday Posters and Exhibits (12:45pm - 1:15pm)

Tuesday, 12:45 PM - 01:15 PM • Lakeside Learning Center

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ER

LL-ERS-TUB • AMA PRA Category 1 Credit™:0.5

LL-ERS-TU1B • Incidental Atherosclerosis on Abdominal/Pelvic CT of Young Patients and Its Association with Risk Factors of Cardiovascular Disease and Diabetes

Steven Peti MD (Presenter) ; David S Sarkany MD ; Michael Coords MD ; David J Krausz MD ; Adam M Bernheim MD ; Nima Jadidi MD ; Adam Hodes ; Bernard Goldwasser MD ; Amrita K Arneja MD

PURPOSE

The objective of this study was to examine the significance of incidental vascular calcifications found on abdominal computed tomography imaging in young patients, when compared to serum parameters of dyslipidemia and diagnoses of diabetes.

METHOD AND MATERIALS

A retrospective study reviewing incidental atherosclerosis on CT imaging of the abdomen/pelvis in 269 young patients, between the ages of 25 and 50, was performed. Patients were classified into mild, moderate, and severe groups based on calcium load. Clinical histories were reviewed. A control group of 678 patients without atherosclerotic calcification was used for comparison.

RESULTS

Using an analysis of variance, a significant difference was found between level of severity of atherosclerotic disease (mild = 112 patients, moderate = 73 patients, and severe = 84 patients) and LDL ($p = 0.008$) and total cholesterol ($p = 0.01$). The mean LDL levels of patients classified as having severe atherosclerotic disease was 129 ± 48 , versus 108 ± 46 in the mild category ($p = 0.003$). The mean total cholesterol levels of patients classified as having severe atherosclerotic disease was 193 ± 212 , versus 164 ± 166 in the mild category ($p = 0.001$). When compared to the control group, diabetes mellitus was significantly more prevalent among each groups of patients with atherosclerotic calcification (6% versus 23%, 32%, 29% for mild, moderate, severe groups respectively). Patients with any atherosclerotic disease had significantly higher triglyceride levels (mean 136 versus 174, $p = 0.003$).

CONCLUSION

The incidental finding of atherosclerotic calcification on abdominal CT in young patients demonstrated the degree of severity of calcifications is correlated with higher levels of LDL and total cholesterol. In addition, just the presence of incidental atherosclerotic calcification is correlated with higher prevalence of diabetes and elevated triglyceride levels.

CLINICAL RELEVANCE/APPLICATION

The above correlations suggest the need for the radiologist to alert the referring clinician to the fact that their patient may have risk factors of cardiovascular disease and/or diabetes.

LL-ERS-TU2B • Reading Trauma: Inter-observer Variability and Discrepancy between Residents and Attendees in Reading Whole Body CT in Major Trauma

Charlie Sayer MBBS,FRCR ; Tharsi Sarvananthan MBBS, MRCS (Presenter) ; Sananda Haldar MBBS ; Ahmed Dagher MRCP, FRCR

PURPOSE

To assess the reliability of primary reporting of trauma CT by radiology residents and its affect on patient safety.

METHOD AND MATERIALS

As part of a large retrospective cohort analysis of a UK major trauma centre's experience of whole body split bolus CT scanning the discrepancy rate between the provisional out-of-hours resident report and the subsequent senior (consultant/attending) radiologist report was analysed. A 3 point scoring system was devised where: 1 = No discrepancy; 2 = Minor discrepancy (no impact on emergency patient management); and 3 = major discrepancy (change in emergency management with implications for patient safety). Discrepancies were subsequently analysed for trends in order to aid future learning.

RESULTS

Over a 9 month period 177 whole body trauma CT scans were performed following polytrauma according to the institution protocol. In our preliminary study 53.8% of patients had sustained major injury on CT (defined as an ISS score >15) and 25.0% were negative for any injury. 33% ($n = 59$) of scans were provisionally reported by a resident on call and subsequently second read by a senior radiologist. Of these 74.6% ($n = 44$) resulted in no discrepancy and 23.7% ($n = 14$) in a minor discrepancy. There were no major discrepancies. In the cases of minor discrepancies 100% where the result of a missed finding rather than overcalls: Most frequently (64.3% $n = 9$) this was a vertebral fracture not requiring surgical management; in 14.3% ($n = 2$) a minor liver laceration was missed; other discrepancies included an inferior pubic ramus fracture, an incidental femoral non-ossifying fibroma and a small retroperitoneal haematoma managed conservatively. Images of these missed injuries are reviewed in this presentation.

CONCLUSION

The provisional reading of polytrauma CT out-of-hours by radiology residents is safe. There were no major discrepancies between residents and senior radiologists. The incidence of minor discrepancies was low (23.7%) and in no case did this have an impact on the patient's management.

CLINICAL RELEVANCE/APPLICATION

Out-of-hours resident reporting of whole body CT for multitrauma is safe and results in a low incidence of discrepancies with no significant impact on patient management.

LL-ERS-TU3B • CT of the Cervical Spine in Trauma Patients: Evaluation of Ordering Practices

Steven R Kussman MD (Presenter) ; Powen Tu MD, PhD ; Fonda Chan MD ; Akifumi Fujita MD ; Nadja Kadom MD ; Osamu Sakai MD, PhD *

PURPOSE

To analyze the results of cervical spine (C-spine) CTs in the trauma setting based on patient demographics and presence of a concurrently

ordered head CT.

METHOD AND MATERIALS

The IRB approved this HIPAA-compliant retrospective study. Informed consent was waived. The study period was 1/1/2011 to 3/1/2012. A review of all C-spine CTs ordered from the Emergency Department at a level 1 trauma center for trauma was performed. Patient age, gender, ordering physician, and findings were recorded. Note was also made if the C-spine CT was ordered concurrently with a head CT. 345 C-spine CTs ordered with a head CT (combined group) and 346 C-spine CTs ordered individually (alone group) were analyzed. Cases were considered positive if there was a C-spine fracture or questionable traumatic findings confirmed by subsequent MRI.

RESULTS

The overall rate of positive C-spine findings was 3.8% in the combined group and 3.2% in the alone group (p=0.52). The most common indication for the combined study was "falls" (51.1%), while the most common indication for the alone group was "motor vehicle collision (MVC)" (59.5%). Of all cases with the indication "MVC", the positive rate was a 12.5% in the combined group and 1.5% in the alone group (p=0.015). Of all cases with the indication "falls", the positive rate was 1.1% in the combined group and 5.9% in the alone group (p=0.11). The average age of the combined group was 51.3 and the average age in the alone group was 40.3 (p

CONCLUSION

The overall rate of positive c-spine findings in the combined and alone groups were similar. However, trends emerged based on study indication, with a statistically significant increase in positive c-spine findings for "MVC" when a combined study was ordered. This could be due to more serious accidents leading to a more comprehensive order. A trend in the other direction was noted in those studies for "falls", with more positive findings in the C-spine alone group. In these cases, perhaps the combined studies were ordered in those intoxicated or unable to give proper history, while c-spine alone patients were able to explain focal symptoms.

CLINICAL RELEVANCE/APPLICATION

ER physicians may be able to better tailor their ordering practices based on the mechanism of injury to maximize injury detection while minimizing radiation exposure.

LL-ERS-TU4B • Detection of Occult Vertebral Fractures by Quantitative Assessment of Bone Marrow Attenuation Values at MDCT

Frank Oliver G Henes MD (Presenter) ; Michael Groth ; Christian Schaefer ; Marc Regier ; Thorsten Derlin ; Gerhard B Adam MD ; Peter Bannas MD

PURPOSE

To determine a cut-off value of Hounsfield attenuation units (HU) at MDCT for valid and reliable detection of bone marrow edema (BME) related to occult vertebral fractures.

METHOD AND MATERIALS

36 patients underwent MDCT and MRI for evaluation of vertebral fractures of the thoracolumbar spine. HU values at MDCT were independently assessed by two readers in a total of 196 vertebrae. Reliability was assessed by intraclass correlation coefficient and Bland-Altman analysis. For each patient the vertebra with the lowest HU value was determined and the HU-difference to each other vertebral body was calculated. HU-differences were subjected to ROC curve analysis to determine the diagnostic accuracy for detection of BME as determined by MRI, which served as the reference standard. Results of HU-measurements were compared with standard visual evaluation of MDCT.

RESULTS

HU measurements demonstrated a high interrater reliability (ICC=0.984). ROC curve analysis (AUC=0.978) exhibited an ideal cut-off value of 29.6 HU for detection of BME associated with vertebral fractures with an accuracy of 97.4% as compared to 93.4% accuracy of visual evaluation. Particularly, HU-measurements increased the sensitivity for detection of vertebral fractures from 78.0% to 92.7% due to the detection of 7 of 9 occult fractures that were missed by visual evaluation alone.

CONCLUSION

Assessing bone marrow density by HU measurements using the cut-off of 29.6 HU is a valid and reliable tool for detection of BME related to occult vertebral fractures in MDCT.

CLINICAL RELEVANCE/APPLICATION

The introduced technique allows more accurate treatment decisions without the need for further diagnostic work-up with MRI.

LL-ERE-TU5B • Current Concepts in the Imaging of Traumatic Dental Injury (TDI): Much More than a "Broken Tooth"

Ashley A Tuttle MD (Presenter) ; Steven A Brown DMD ; Glenn A Tung MD

PURPOSE/AIM

TDI is common but frequently overlooked or incorrectly described by radiologists. In a busy level I trauma center, a dental consultation for TDI occurs daily. This electronic exhibit will raise awareness of dental trauma by reviewing basic dental anatomy, discussing the spectrum of TDI and focusing on radiologic findings that most impact management decisions.

CONTENT ORGANIZATION

We review normal dental anatomy, methods of dental imaging in the emergency department and common mechanisms of TDI. Types of crown, crown-root and root fractures, and the spectrum of periodontal injuries, including luxations and avulsion, will be discussed. Examples of these injuries will be demonstrated on panoramic radiography and computed tomography. We will describe the treatment of TDI and specify dental imaging signs that critically influence management.

SUMMARY

After viewing this exhibit, radiologists will have a heightened awareness of TDI: They will understand dental anatomy, the spectrum of TDI and critical signs on dental imaging that will enable them to provide more detailed and pertinent information in their reports.

Emergency Radiology (Brain Emergencies)

Tuesday, 03:00 PM - 04:00 PM • N227

ER CT NR

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SSJ07 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

Wayne S Kubal, MD *

Moderator

Suzanne T Chong, MD

SSJ07-01 • Monoenergetic Reconstruction of Acute NC DECT Head at 68 keV and 108 keV Results in Superior Image Quality in Comparison to Polychromatic CT in Improvement of Grey-white Matter Differentiation and Reduction in Posterior Fossa Artifact

Adrian Reagan MD (Presenter) ; Niv Khorrami ; Savvas Nicolaou MD ; Luck J Louis MD ; Ana-Maria Bilawich MD ; Sharon Gershony MD

PURPOSE

To determine whether DECT head generated monoenergetic data sets reduces petrous apex beam hardening artifact and improves

assessment of gray- white differentiation in the ED.

METHOD AND MATERIALS

A total of 20 consecutive DECT head studies were scanned on the 128-slice dual source scanner in the ED. Protocol included the following parameters, 64 by 0.6mm collimation reconstructed to, 3mm, axial slices at 100 kv and 140kv Sn. The 3 mm 20 D34 axial DECT scans were uploaded in the monoenergetic dual energy class on the multimodality workplace and ME energy levels from 40 to 190 keV in 4 keV increments were analyzed through the cerebrum. Noise was calculated by using the standard deviation of 4 regions of interest measuring 10mm(sq) within the pons, external capsule, head of the caudate, and gray white interface. The weighted mixed data DECT 3 mm axial images simulating a 120 kvp exam were analyzed on the MMWP as well using identical ROI size and anatomic distribution from the same patients. Signal to noise ratio was compared between the monoenergetic and weighted polychromatic data sets. Subjective image quality and diagnostic confidence using a 5-point Likert scale was performed between the two data sets by two ER radiologists one with 12 and one with 5 years of experience.

RESULTS

A Mann-Whitney U test was used to compare the SNR between the monoenergetic and polychromatic DECT weighted data sets and maximal optimal values were appreciated at 68keV and at the 108 keV monoenergetic levels resulting in a U value of 1 ($p < 0.01$). Similar statistical analysis of the supratentorial brain yielded a U value of 0 ($p < 0.01$). The two radiologists reported superior grey white matter differentiation and a greater reduction of beam hardening artifacts on the monoenergetic images as compared to routine weighted 120 kvp axial scans.

CONCLUSION

Monoenergetic generated scans from DECT heads at 68 keV and 108 keV improved the assessment of the posterior fossa and grey-white matter differentiation.

CLINICAL RELEVANCE/APPLICATION

Acute Stroke evaluation with Monoenergetic images obtained from DECT heads has the potential in improving the detection of acute brain infarcts.

SSJ07-02 • Non-contrast Head CT with 3rd Generation Integrated Circuit CT Detector: Subjective Improvement in Grey-white Matter Differentiation in the Acute Setting

Patrick McLaughlin FFRCSI (Presenter) ; **Graeme J McNeill** MRCP, FFRCSI ; **Shamir Rai** BSC ; **Taryn L Reddy** FRANZCR ; **Teresa Liang** MD, BSc ; **Nivmand Khorrami-Arani** MBBS, BSc ; **John R Mayo** MD * ; **Hugue A Ouellette** MD ; **Savvas Nicolaou** MD

PURPOSE

Accurate and reliable differentiation between cerebral grey and white matter structures demands both high contrast and spatial resolution from a CT system. Recently 3rd generation CT detectors, which employ integrated (IC) rather than discrete (DC) electronic circuits, have been introduced into clinical practice. Phantom studies demonstrate reduced electronic noise and increased spatial resolution but the clinical benefits of IC detectors for head CT have yet to be evaluated.

METHOD AND MATERIALS

853 consecutive patients underwent non-contrast helical Head CT over a 28 day period in the ED using a dual source 128-slice CT system with IC detectors (Stellar; Siemens Healthcare, Forchheim, Germany). 77 patients who were previously imaged using the same CT system and protocol (120kv, ref mAs 350, 128x0.6 mm) with DC detectors were included in this retrospective intra-individual study. Subjective analysis of deep and superficial grey and white matter differentiation (GWD) was independently performed by 1 general and 1 subspecialty neuroradiologist using a semi-objective 5 point scoring scheme at a standardized window width, level and slice thickness (W=48, L=40HU, 3mm). Objective analysis of image noise was also performed for all datasets.

RESULTS

CONCLUSION

The use of integrated 3rd generation CT detectors results in improved subjective grey and white matter differentiation in the frontal, parietal and insular regions on helical CT head examinations.

CLINICAL RELEVANCE/APPLICATION

The use of integrated 3rd generation CT detectors results in improved subjective grey and white matter differentiation in the frontal, parietal and insular regions on helical CT head examinations.

SSJ07-03 • Whole-brain 320-detector Row Dynamic Volume CT Perfusion Performed on Hyperacute Ischemic Stroke Patients within 4.5 hours Improves Diagnostic Sensitivity and Accuracy

Zhu-Ren Luo (Presenter) ; **Xiong-Jie Zhuang** ; **Rong-Zhou Zhang** ; **Bao-Zhong Shen**

PURPOSE

To determine if use of whole-brain CT perfusion (CTP) with an extended range covering the entire brain could improve diagnostic sensitivity and accuracy relative to non-contrast CT (NCCT) for patients presenting with stroke symptoms.

METHOD AND MATERIALS

A total of 30 patients presenting to our emergency department with symptoms of ischemic stroke within 4.5 h of the event were included in the study. All were subject to whole-brain Perfusion CT, which includes NCCT, and were then immediately evaluated by diffusion-weighted MRI or DWI. The NCCT and CTP were evaluated by two physicians for evidence of acute infarct and vascular territory, if present. CTP covered the whole brain (16 cm coverage); low relative cerebral blood volume (CBV) in a region of low cerebral blood flow (CBF) or elevated time to peak (TTP) was the operational definition for ischemia or infarct. A third physician rated the DWI for acute infarct and vascular territory, if present. Sensitivity, specificity, and negative and positive predictive values were calculated. Statistical analysis was performed using an exact McNemar test and generalized by estimating equations from a binary logistic regression model to assess the difference in detection rates between modalities. A two-sided P value < 0.05 was considered significant.

RESULTS

Of the 30 patients evaluated, NCCT revealed two (6.7%) acute infarcts without false positives. CTP revealed 28 (93.3%) acute infarcts with one false positive. Of the two infarcts missed on CTP, one was a small cortical infarct, whereas the other was a lacunar type infarct (< 10 mm in size). CTP was significantly more sensitive (93.3 vs. 6.7%, $P < 0.05$), accurate (76.0 vs. 52.0%, $P < 0.05$), and had a better negative predictive value (93.5 vs. 51.7%, $P < 0.05$) than NCCT.

CONCLUSION

A 320-slice CT allows completing dynamic visualization of entire brain and enables calculation of whole-organ perfusion maps. Whole-brain CTP improved sensitivity and accuracy relative to NCCT in this cohort of 30 patients with symptoms of hyperacute stroke evaluated within 4.5 hours of the event.

CLINICAL RELEVANCE/APPLICATION

320-slice CT can enable calculation of whole-brain perfusion maps and improve sensitivity and accuracy for diagnosing hyperacute stroke.

SSJ07-04 • Improvement of Image Quality (IQ) with Model Based Iterative Reconstruction (MBIR) Algorithm in Cranial CT (CCT) in Trauma Patients

Susan Notohamiprodjo MD (Presenter) ; **Zsuzsanna Deak** MD ; **Fabian Mueck** ; **Felix Meurer** ; **Maximilian F Reiser** MD ; **Stefan Wirth** MD *

PURPOSE

CCT is a frequently needed examination in emergency medicine. Compared to the current clinical standard of image reconstruction Adaptive Statistical Iterative Reconstruction (ASIR), MBIR is a more advanced algorithm promising improved spatial resolution and reduced image noise. The aim of the study was to compare the effects of MBIR in CCT imaging to ASIR on identical dose levels.

METHOD AND MATERIALS

Raw data sets of anonymized 100 trauma patients receiving CCT according to the institutional standard protocol (120 kV, 260 mAs, 20 mm detector collimation; 0.984 pitch) were reconstructed with ASIR and MBIR, multiplanar reformations of 2.5 mm axial, coronar and sagittal slices were calculated. Two radiologists blinded to the reconstruction independently rated IQ by the depiction of different parenchymal structures and the effect streak artifacts of photon starvation using a semi-quantitative scale (0: non-diagnostic, 1: impaired, 2: sufficient, 3: good, 4: excellent). Mean attenuation value (MAV; [HU]) and standard deviation (SD;[HU]) were measured for liquor space (LS) and white matter (WM) supratentorial (ST) and in the posterior fossa (PF). Data were analyzed using ICC, Mann-Whitney-U and ANOVA testing.

RESULTS

MBIR significantly decreased streak artifacts in PF (p

CONCLUSION

Our results suggest significant improvement of IQ with MBIR in comparison to ASIR in CCT of trauma patients.

CLINICAL RELEVANCE/APPLICATION

MBIR significantly improves IQ and could represent an effective method to decrease radiation dose of CCT imaging, which is one of the most important causes for increase of public radiation exposure.

SSJ07-05 • Acute Intracranial Hemorrhage in Computed Tomography - Benefits of Sinogram-affirmed Iterative Reconstruction Techniques

Boris Bodelle MD (Presenter) ; Boris Schulz MD ; Firas Al-Butmeh ; Thomas Lehnert MD ; Julian L Wichmann MD ; Claudia Frellesen ; Ralf W Bauer MD * ; Josef Matthias Kerl MD * ; Thomas J Vogl MD, PhD

PURPOSE

To compare image quality (IQ) and intracranial hemorrhage (ICH) in brain computed tomography (CT) with sinogram-affirmed iterative reconstruction (SAFIRE) and filtered-back-projection (FBP) reconstruction techniques at standard and low dose tube current levels.

METHOD AND MATERIALS

The study was approved by the IRB. 54 patients (mean age 64 ± 20 years) in group 1 and 40 patients in group 2 (mean age 57 ± 23 years) received CT at two different tube current*time products (group 1: 340 mAs; group 2: 260 mAs) in a multi-detector CT. Images were reconstructed with FBP and five different iterative strengths (S1-5) and were ranked (5-point scale) by two radiologists for IQ and ICH in a blinded manner. Image noise (IN), signal-to-noise ratio (SNR), dose-length product (DLP, mGycm) and mean effective dose (mSv) were calculated.

RESULTS

FBP at standard 340 mAs and S1 at 260 mAs showed no statistical significance (p < 0.05) for subjective rating. IN was higher (p < 0.05) in group 2. SNR increased with higher strength of SAFIRE in both groups. There was predominantly no significant difference in SNR between FBP and S1. Highest SNR was achieved with S5. Best score for subjective rating of IQ/ICH was achieved with S3/S4-5. Patients were exposed to a significantly lower dose in group 2 (mean: 744 mGycm/1.71 mSv) than group 1 (mean: 1045 mGycm/2.40 mSv, p

CONCLUSION

SAFIRE provides better IQ and visualization of ICH in brain CT. Dose reduction by almost one-third is possible without significant loss in diagnostic quality.

CLINICAL RELEVANCE/APPLICATION

Sinogram-affirmed iterative reconstruction technique provides better image quality and visualization of intracranial hemorrhage in brain CT with almost one-third dose reduction compared with FBP.

SSJ07-06 • Screening CT in Mild Traumatic Brain Injury: Comparison of Two Mostly Used Clinical Guidelines in a Tertiary Referral Hospital in Northeastern Japan

Daddy Mata Mbemba MD, PhD (Presenter) ; Shunji Mugikura MD, PhD ; Atsuhiko Nakagawa ; Takaki Murata MD ; Li Li MD, PhD ; Kei Takase ; Teiji Tominaga ; Shigeki Kushimoto PhD ; Shoki Takahashi MD

PURPOSE

To avoid unnecessary CT, Canadian CT Head Rule (CCHR) and New Orleans Criteria (NOC), each containing 7 clinical items, are widely-used guidelines to indicate screening CT in mild traumatic brain injury (TBI). We aimed to compare the two guidelines in predicting Clinically Important CT Findings (CICF), by introducing two scoring systems.

METHOD AND MATERIALS

Consecutive 142 mild TBI {Glasgow coma scale (GCS):13-15} patients (age: 17-88 years), who underwent CT examination indicated by either CCHR or NOC, were included. We introduced two 8-graded (0 to 7) scores and assigned them to each patient, Canadian score from CCHR and New Orleans score from NOC: a patient's score represented a sum of the number of positive items, each of which was rated +1 if present. Two neuroradiologists reviewed screening CT for CICF. In all the GCS13-15 patients, we examined whether both scores were related to CICF by univariate analysis, logistic regression and receiver operator characteristic curve. We also used logistic regression to determine which of the 14 clinical items included in either guideline, independently predicts CICF. Since NOC is applied only for GCS-15 patients, we additionally compared two scoring systems only in GCS-15 group (n=67).

RESULTS

Of 142 mild TBI patients, 49 patients (34.5%) showed CICF. In GCS 13-15 group, both scores showed a significant relationship to CICF (P< 0.05) in univariate analysis. However, in multivariate analyses, only Canadian score was a predictor of CICF (P=0.0130) yielding a better performance (AUC=0.69) than New Orleans score (AUC=0.63). In addition, among all 14 clinical items included in either guidelines, the item of GCS

CONCLUSION

In mild TBI, CCHR was a better predictor of CICF in a tertiary referral hospital in northeastern Japan. Our results are consistent with a big-scale western-study.

CLINICAL RELEVANCE/APPLICATION

In mild TBI, selective use of CT decreases unnecessary irradiation, but improper selection can lead to missing life-threatening lesions. Our study encourages the use of CCHR for efficient CT scanning.

Essentials of Trauma Imaging

Tuesday, 03:30 PM - 05:00 PM • S100AB



MSES34 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

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MSES34A • 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 MBBCh (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 to 12 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.

Stroke Imaging for the Emergency Radiologist (An Interactive Session)

Tuesday, 04:30 PM - 06:00 PM • E450B



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RC408 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC408A • Early and Easily Missed Findings on Non-contrast Head CT

Diego B Nunez MD, MPH (Presenter)

LEARNING OBJECTIVES

1) Demonstrate understanding of the role of non contrast brain CT (NCCT) in the setting of acute ischemic stroke. 2) Identify early and subtle CT findings that can easily escape recognition in patients with suspected stroke. 3) Analyze imaging clues to minimize errors in interpretation and to diagnose stroke mimickers and pitfalls.

ABSTRACT

RC408B • Fundamentals of CT Angiography and CT Perfusion in Stroke Imaging

Wayne S Kubal MD (Presenter) *

LEARNING OBJECTIVES

1) Discuss the role of CT angiography (CTA) and CT perfusion (CTP) in the evaluation of acute ischemic stroke. 2) Through the use of illustrative examples, identify CTA and CTP findings that contribute to the diagnosis and characterization of acute ischemic stroke. 3) Through the use of illustrative examples, recognize the limitations and pitfalls of CTA and CTP in the evaluation of acute ischemic stroke.

ABSTRACT

According to the American Heart Association, stroke is the third leading cause of death in the United States and a leading cause of serious, long-term disability. Based on data gathered from over twenty clinical trials, thrombolytic therapy has shown to be of substantial benefit for select patients with acute cerebral ischemia. Patient selection is based in part upon imaging. In patients with acute onset of stroke-like symptoms, CT angiography (CTA) and CT perfusion (CTP) can help to rule out a nonvascular etiology for the symptoms, define the extent of the acute ischemic process, and differentiate between the infarcted core and the ischemic penumbra. By characterizing the ischemia, CTA and CTP can help to identify which patients might benefit from thrombolytic therapy, direct the therapy for maximum effectiveness, and, on subsequent imaging, evaluate the effectiveness of therapy. Multiple examples will also illustrate the limitations and pitfalls of CTA and CTP in the evaluation of acute ischemic stroke.

RC408C • Fundamentals of MR in Stroke Imaging

Peter G Kranz MD (Presenter)

LEARNING OBJECTIVES

1) WHEN: Understand how the appearance of ischemia changes with time on conventional MRI. 2) WHERE: Review the distribution of the major intracranial arteries and their watersheds. 3) WHY: Understand how certain MR imaging patterns can suggest the etiology of stroke.

RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

Wednesday, 08:30 AM - 10:00 AM • S402AB

PD ER NR HN

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MSSR41 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSSR41A • General Principles

Ulrich Linsenmaier MD (Presenter)

LEARNING OBJECTIVES

1) Demonstrate general principles of diagnostic imaging in Emergency Radiology in traumatic and non-traumatic emergencies. 2) Analyze etiology, background and management of common radiological emergencies. 3) Identify the role, indications and protocols for US, CR, MDCT in modern emergency radiology.

ABSTRACT

MSSR41B • Challenges of Imaging Pediatric Abdominal Emergencies

Susan D John MD (Presenter)

LEARNING OBJECTIVES

1) Plan safe and effective imaging strategies to evaluate abdominal pain in infants and children. 2) Understand the common and unusual causes of abdominal pain in different pediatric age groups. 3) Recognize potentially confusing variations in the appearance of these conditions with imaging.

ABSTRACT

MSSR41C • Imaging in ENT Emergencies

Diego B Nunez MD, MPH (Presenter)

LEARNING OBJECTIVES

1) Analyze imaging findings in patients presenting with acute head and neck conditions using a systematic spatial approach. 2) Demonstrate understanding of the role and indications of CT and MR in acute non-traumatic ENT case management. 3) Identify the extent of disease and recognize specific complications of cervicofacial infections.

ABSTRACT

Bone and Cartilage Injury: Traumatic and Stress-related Chondral, Osteochondral and Subchondral Failure with Emphasis on Pathophysiology and Routine and Advanced MR Imaging

Wednesday, 08:30 AM - 10:00 AM • N227

ER MR MK

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RC504 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Donald L Resnick, MD
Christine B Chung, MD
Mini N Pathria, MD
Yolanda Y Lee, MBChB *
Monica Tafur, MD

LEARNING OBJECTIVES

1) Discuss the structural anatomy of a. articular cartilage with emphasis on its collagen framework and b. the trabecular architecture in the subchondral bone. 2) Emphasize the manner in which the collagen and trabeculae respond to compressive, shear, and tensile forces applied to the joint surface and the resultant injuries as they are displayed in MR images. 3) Emphasize the anatomy and biomechanical implications of the osteochondral unit through novel MRI applications. 4) Discuss structure and biomechanics of bone tissue with regard to the pathogenesis of fatigue and insufficiency forms of stress injury. 5) Use case-based teaching methods to illustrate the imaging spectrum of traumatic and stress-related chondral, osteochondral, and subchondral injuries.

Child Abuse (An Interactive Session)

Wednesday, 08:30 AM - 10:00 AM • S103AB

PD ER

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RC513 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC513A • Parenchymal Brain Injury in the Setting of Child Abuse

Ellen Grant MD (Presenter)

LEARNING OBJECTIVES

1) To review the unique properties of the infant brain that influence patterns of brain injury. 2) To review the common patterns of brain injury associated with abuse and discuss potential etiologies. 3) To increase awareness of white matter tears and delayed appearance of brain injuries. 4) To discuss optimal imaging protocols.

ABSTRACT

The Neuroradiologist plays a critical role in raising concern for abusive head trauma. However, to be effective in this role, it is important to be up to date on the patterns often associated with abusive head injury and their temporal evolution. In this lecture, recent literature and current controversies in parenchymal brain injury in the setting of child abuse will be reviewed.

RC513B • Musculoskeletal Injuries and Common Mimickers

Jeannette M Perez-Rossello MD (Presenter)

LEARNING OBJECTIVES

1) Describe the skeletal injury patterns seen with physical child abuse. 2) Be familiar with the mechanism of injury of inflicted injuries. 3) Know the type and specificity of abusive injuries. 4) Differentiate metabolic bone disease, skeletal dysplasias, accidental injuries and normal variants that can mimic abuse. 5) Recommend imaging and medical workup for the evaluation of suspected abuse.

ABSTRACT

Skeletal injuries are the most common findings noted on imaging studies in cases of child abuse. In contrast to central nervous system and other visceral injuries, they are rarely life threatening. In infants, certain lesions, like posterior rib fractures and classic metaphyseal lesions, have high specificity for abuse. Posterior rib fractures at the costovertebral articulations occur with anteroposterior compression of the thorax that may be associated with shaking. The classic metaphyseal lesion (CML) results from torsional and tractional forces applied to the extremities, and may occur with acceleration forces associated with infant shaking. Other less specific injuries when correlated with other imaging findings and clinical history may add support for the diagnosis of abuse. The detection of skeletal injuries depends on the technical quality and thoroughness of the skeletal survey. Failure to perform an adequate skeletal survey may result in the return of a child to a potentially dangerous environment. Diagnostic imaging can identify a variety of conditions that can be confused with child abuse. Fractures and/or metaphyseal irregularities simulating CMLs can be seen in osteogenesis imperfecta, rickets, syphilis, certain bone dysplasias, and as a result of traumatic delivery. Subperiosteal new bone formation (SPNBF) can be seen with Caffey's disease, sickle cell anemia, leukemia and osteomyelitis. Developmental variants, such as physiologic SPNBF can be easily confused with skeletal injury. These entities can generally be distinguished from abuse by the history, physical exam, laboratory data and careful imaging evaluation.

RC513C • Imaging of Spinal Injuries in Abused Children

Michelle Silvera MD (Presenter)

LEARNING OBJECTIVES

1) Become familiar with the incidence and imaging appearance of spinal injuries in children with abusive trauma. 2) Better understand imaging strategies for detection of spinal injury in children with non-accidental trauma. 3) Be aware of the role of MRI in assessing spinal injury.

ABSTRACT

Spinal injuries in young children with abusive trauma are difficult to diagnose clinically and easily overlooked. Therefore, careful imaging attention to the spine is warranted. The practicing radiologist plays an important role in recommending appropriate imaging tests in order to identify these injuries. Radiographic images provided by the skeletal survey have a low yield in detecting spinal injury and are insensitive for subtle compression fractures, intraspinal hematomas and paraspinal soft tissue disruptions. These lesions are best identified by spinal MRI. Diagnosing an unexpected spinal injury will result in management interventions designed to protect the spine, while missing a spinal injury may result in ongoing spinal instability. Furthermore, identifying a traumatic spinal lesion in a complex case may add additional support to a diagnosis of trauma.

RSNA/ESR Emergency Symposium: CNS Emergencies (An Interactive Session)

Wednesday, 10:30 AM - 12:00 PM • S402AB



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MSSR42 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSSR42A • CNS Trauma and Neurovascular Injury

Howard A Rowley MD (Presenter) *

LEARNING OBJECTIVES

1) To be familiar with traumatic brain injury demographics and classification schemes. 2) Be able to apply appropriateness criteria for head trauma imaging in children and adults. 3) Identify key imaging patterns and pitfalls in the evaluation of brain and neurovascular trauma.

ABSTRACT

This lecture on **Acute Head Trauma** is divided into 4 parts: Part 1 will briefly review TBI demographics. Part 2 will discuss the current imaging approach to acute TBI in today's clinical practice. Part 3 will briefly describe the most common TBI classification schemes. Part 4 will illustrate the imaging manifestations of the different injuries located in the *extra-axial* space (e.g., scalp and skull injury; epidural, subdural, subarachnoid and intraventricular collections), and the *intra-axial* space (e.g., dysautoregulation, contusion, hematoma, penetrating TBI, axonal injury, fat emboli). Note that a common theme throughout the lecture will be *Lessons I've Learned Since Neuroradiology Fellowship* ;-)

MSSR42B • CNS Non-Traumatic Emergencies

Marion Smits MD, PhD (Presenter)

LEARNING OBJECTIVES

1) To know the modalities (CT/MRI) and protocols for non-traumatic neurological emergencies. 2) To know and diagnose the main non-traumatic neurological vascular and non-vascular emergencies. 3) To be aware of the pitfalls and limitations of clinical presentation and imaging findings in non-traumatic neurological emergencies.

ABSTRACT

Neurological emergencies are often associated with high morbidity and mortality, and thus require prompt diagnostic and therapeutic action. Non-traumatic emergencies may however have a subacute onset, and radiological signs may be subtle, which can lead to delay in diagnosis.

MSSR42C • Interactive Case Discussion

Howard A Rowley MD (Presenter) * ; Marion Smits MD, PhD (Presenter)

LEARNING OBJECTIVES

1) To review traumatic brain injury (TBI) and non-traumatic neurological emergencies. 2) To describe imaging manifestations of TBI and non-traumatic neurological emergencies. 3) To understand the clinical implications of radiological imaging findings in TBI and non-traumatic neurological emergencies. 4) To know the state-of-the-art radiological imaging options for the assessment of acute TBI and non-traumatic neurological emergencies.

ABSTRACT

This interactive case discussion builds on the two previous lectures in this session, on traumatic and non-traumatic neurological emergencies respectively. Both lecturers will take the audience through several clinical cases, highlighting and emphasizing important issues from their lectures, such that the previously presented theory is placed in a clinical context. Preferably, the participants will have attended the two prior lectures, to optimally benefit from and participate in this interactive case discussion.

**LL-ERS-WEA • AMA PRA Category 1 Credit™:0.5**

Host
Les R Folio, DO, MPH
Host
Jonas C Apitzsch, MD

LL-ERS-WE1A • Contribution of the Computed Tomography of the Anatomical Aspects of the Sphenoid Sinuses, to Forensic Identification

Idris Diallo (Presenter); **Mathieu Auffret**; **Marc Garetier MD**; **Mathilde Frerot**; **Claire Saccardy**; **Douraid Ben Salem MD, PhD**

PURPOSE

Body identification is the cornerstone of forensic investigation. It can be performed using radiographic techniques, if antemortem images are available. This study was designed to assess the value of visual comparison of the CT anatomical aspects of the sphenoid sinuses, in forensic individual identification.

METHOD AND MATERIALS

This retrospective work took place in a university hospital. The supervisor of this study randomly selected from the PACS, 58 patients who underwent one (16 patients) or two (42 patients) head computed tomography in various neurological contexts. To avoid bias, those studies were prepared (anonymized, and all the head structures but the sphenoid sinuses were excluded), and used to constitute two work lists of 50 (42+8) computed tomography exams of the sphenoid sinuses. An anatomical classification system of the sphenoid sinuses anatomical variations was created based on the anatomical and surgical literature. In those two work lists, three blinded readers had to identify, using the anatomical system and subjective visual comparison, 42 pairs of matched studies, and 16 unmatched studies. Readers were blinded from the exact numbers of matching studies.

RESULTS

Each reader correctly identified the 42 pairs of CT with a concordance of 100% [97,5% confidence interval: 91-100%], and the 16 unmatched CT with a concordance of 100% [97,5% confidence interval: 79-100%]. Overall accuracy was 100%.

CONCLUSION

Our study shows that establishing the anatomical concordance of the sphenoid sinuses by visual comparison, could be used in personal identification, especially if antemortem dental records, fingerprints or DNA samples are not available. This simple and fast method, based on a frequently and increasingly prescribed exam, still needs to be assessed on a postmortem cohort. Integration of head CT examinations in missing person databases should be considered, for purposes of personal identification.

CLINICAL RELEVANCE/APPLICATION

The anatomical concordance of the sphenoid sinuses by visual comparison, could be used in personal identification if antemortem dental records, fingerprints or DNA samples are not available.

LL-ERS-WE2A • Cardiothoracic Ratio in Post-mortem Computed Tomography: Reliability and Threshold for the Diagnosis of Cardiomegaly

Sebastian Winklhofer MD (Presenter); **Nicole Berger MD**; **Thomas D Ruder MD**; **Paul Stolzmann MD**; **Michael J Thali MD**; **Hatem Alkadhi MD**; **Garyfalia Ampanozi MD**

PURPOSE

Aim of this study was to evaluate the reliability of the cardiothoracic ratio (CTR) in postmortem computed tomography (PMCT) and to assess a CTR threshold for the diagnosis of cardiomegaly based on the heart weight derived from autopsy.

METHOD AND MATERIALS

PMCT data of 170 deceased were retrospectively evaluated by two blinded radiologists. The CTR was measured in axial slices and the actual cardiac weight was derived from conventional autopsy. Inter-rater reliability, sensitivity and specificity were calculated. Receiver operating characteristics curves were calculated to assess enlarged heart weight by CTR. The autopsy definition of cardiomegaly was based on normal values of the Zeek (within a range of both, one or two SD) and the Smith method (within the given range).

RESULTS

Intra-class correlation coefficients (ICC) demonstrated excellent agreements (0.983) regarding CTR measurements. In 105/170 (62%) cases the CTR in PMCT was >0.5, indicating enlarged heart weight, according to clinical references. The mean heart weight measured in autopsy was 405 ± 105 g, resulting in an interpretation of 114/170 (67%) cases of enlarged heart weight regarding the normal values of Zeek within one SD, in 97/170 (57%) within two SD and in 100/170 (59%) according to Smiths normal values. The sensitivity/specificity of the 0.5 cut-off of the CTR for the diagnosis of enlarged heart weight was 78% / 71% (Zeek one SD), 74% / 55% (Zeek two SD), and 76% / 59% (Smith), respectively. The discriminative power was 79%, 73%, and 74% for the normal values of Zeek (1SD/2SD) and Smith to differentiate between normal heart weight and cardiomegaly. Changing the CTR threshold to 0.57 resulted in a minimum specificity of 95% for all three definitions of cardiomegaly.

CONCLUSION

With a CTR threshold of 0.57, cardiomegaly can be ruled in with a very high specificity, which may be useful if PMCT is used by forensic pathologists as a screening tool for medico-legal autopsies.

CLINICAL RELEVANCE/APPLICATION

The cardio-thoracic ratio seems to be a helpful tool in post-mortem computed tomography for a simple assessment of heart weight.

LL-ERS-WE3A • “Normal? Changes Detected on Post Mortem CT Examinations

Sarvenaz Pourjabbar MD (Presenter); **Sarabjeet Singh MD**; **Atul Padole MD**; **Beth Vettiyil MBBS**; **Akshay Saini**; **Mannudeep K Kalra MD ***; **Ranish D Khawaja MBBS, MD**; **Diego A Lira MD**

PURPOSE

To recognize and evaluate normal postmortem findings seen on postmortem imaging.

METHOD AND MATERIALS

In an IRB approved study, 100 adult cadavers (61.66 ± 15.2 years, M: F 62:38) underwent postmortem CT examinations. Head to toe whole body CT were acquired at 120kV, 400 mAs on 128 slice dual source MDCT (Definition FLASH, Siemens) (n= 87, mean age 61.4 ± 15.2 years, M:F 52:35) and 64 slice MDCT (Discovery750HD, GE Healthcare) (n= 13, 63.2 ± 15.9 years, M:F 10:3). Postmortem CT examination was performed as close to death as possible. CT images were read and interpreted by experienced thoracic, neuro and abdominal radiologists. Normal postmortem findings were considered in interpretation of the abnormal CT findings by radiologists. Each case was followed up with detailed autopsy reports for every organ. These pathology and CT findings were finally tabulated for assessing correlation between pathology and radiology findings.

RESULTS

Most post mortem CT examinations were performed within 24 hours (20.0 ± 28.0 hours, n=89). Two cases were scanned 192 hours and 114 hours after death and exact time of death for 26 patients was not recorded on hospital database. Loss of gray white matter was seen in all the cases except for 4 cases in which extensive metal artifacts or air made evaluation impossible. Diffuse cerebral edema was seen in 34 cases (28.6 ± 28.3 hours). Hyperdense sagittal sinus was seen in all patients except in 2 patients due to artifacts. Intravascular air was detected in 17 patients with time to scan range of 3.5- 172 hours. Hyper-attenuating aortic wall was seen in all the patients. Filling defect was seen in great vessels of 80/100 patients. In 48/100 patients, lungs were either collapsed or had diffuse bilateral ground glass or airspace opacities without any definitive pathology correlate, which suggested normal pulmonary changes following death.

CONCLUSION

Postmortem changes start immediately after death due to cessation of circulation, hypoxia and increased activity of intestinal bacteria. Blood sedimentation is a normal postmortem finding, which could be seen as filling defect in heart and large vessels. Loss of gray white matter differentiation, brain edema, hyperdense sagittal sinus, air in solid organs, collapsed lungs and filling defects are among normal postmortem findings which should not be considered pathologic.

CLINICAL RELEVANCE/APPLICATION

Normal post mortem findings should not be mistaken with pathologic pre mortem imaging findings.

LL-ERE-WE4A • Proximal Femur Fractures: What the Orthopedic Surgeon Really Wants to Know

Jeffrey Y Shyu MD (Presenter) ; Scott Sheehan MD ; Michael Weaver MD ; Jeffrey F Chick MD ; Aaron D Sodickson MD, PhD ; Bharti Khurana MD

PURPOSE/AIM

1. Provide an intuitive understanding of the morphologic types, injury mechanisms, and classification systems of adult proximal femur fractures, using multimodality imaging examples, 3D models, and animations. 2. Review the potential complications and management.

CONTENT ORGANIZATION

1. Rationale: To improve interpretation of the clinically relevant features of proximal femur fractures. 2. Describe the normal anatomy, including soft tissue and vascular supply, essential for complete characterization of these fractures. 3. Review the multimodality imaging approach to diagnosis. 4. Review the morphologic types of proximal femur fractures, anatomic features, injury mechanisms, and classification systems using multiple imaging modalities, 3D models, and animations. 5. Outline the reporting process with emphasis on critical features for orthopedists. 6. Describe the treatment principles and potential complications. 7. Provide a case-based conclusion with emphasis on what not to miss.

SUMMARY

Learners will be able to: 1. Understand proximal femur fracture types, mechanisms, imaging features, and classification systems that orthopedic surgeons consider clinically significant. 2. Provide confident imaging interpretation that emphasizes potential complications and best guides early and effective intervention.

LL-ERE-WE5A • Wrist Trauma-What the Surgeon Wants to Know

Joel A Gross MD, MS (Presenter) ; Claire K Sandstrom MD ; Michael L Richardson MD ; Jeffrey B Friedrich MD

PURPOSE/AIM

Simplify and clarify the complex measurements, terminology and classification systems used in evaluating wrist trauma. Enable the radiologist to communicate the relevant critical findings to the hand surgeon.

CONTENT ORGANIZATION

The wrist is a complex region with unusually shaped and oriented bones requiring careful review and dedicated views to ensure adequate evaluation. A number of measurements, lines and relationships have been described to evaluate for the presence and type of injury. In addition, injury patterns and classifications are sometimes confusing or overlapping. These challenges can cause distress and discomfort for trainees and other radiologists without extensive MSK expertise. This exhibit aims to identify the critical findings that the hand surgeon wants and needs to know about, to ensure optimal treatment for the injured wrist. Findings that are not relevant or important to the surgeon can be ignored. This simplified but targeted approach will provide guidance for radiologists to more confidently review images of the wrist, and provide valuable and relevant information to the hand surgeon.

SUMMARY

This educational exhibit provides a simplified practical approach to imaging of wrist trauma that ensures communication of relevant findings to the hand surgeon.

LL-ERE-WE6A • Acute Aortic Syndromes: Review of Pathophysiology, Imaging Characteristics, Complications and Treatment

Urvi P Fulwadhva MD (Presenter) ; Arash Bedayat MD ; Hao S Lo MD ; Dennis Coughlin MD

PURPOSE/AIM

This exhibit reviews the pathophysiology, imaging characteristics, complications and treatment of aortic dissection, including its atypical forms (intramural hematomas and penetrating aortic ulcer) on both unenhanced and contrast-enhanced Computed Tomography (CT).

CONTENT ORGANIZATION

1. Pathophysiology of intramural hematoma, aortic dissection and penetrating ulcer. 2. Imaging characteristics on unenhanced and contrast-enhanced CT of the chest, with emphasis on findings on either modality. 3. Complications that can lead to end organ damage and effective protocols to diagnose most common complications. 4. Sample cases with emphasis on diagnostic pitfalls. 5. Brief review of treatment and follow up imaging.

SUMMARY

CT has a sensitivity and specificity of nearly 100% in diagnosing acute aortic syndromes. Due to its key role in tailoring appropriate treatment in a timely manner, a radiologist must be aware of the diagnostic findings, pitfalls and complications of acute aortic syndromes, and be able to effectively convey pertinent findings. Protocols should include imaging the entire aorta to evaluate associated complications secondary to involvement of the branch vessels and end organ damage.

LL-ERS-WE1B • Illegal Intracorporeal Packets: Assessment of the Cocaine Concentration by Dual CT Imaging

Pierre-Alexandre A Poletti MD (Presenter) ; Alexandra Platon MD ; Thomas Perneger ; Eric Lock ; Hans Wolff ; Christoph D Becker MD

PURPOSE

To evaluate whether dual energy CT can be used to assess the concentration of cocaine of intra-intestinal illegal packets.

METHOD AND MATERIALS

All consecutive conveyers in whom a low-dose abdominal CT revealed the presence of illegal drug packets underwent a dual energy CT series (GE 750 HD), targeted on one container. The mean radiological density (HU) of this packet was obtained on the standard series. The effective atomic number (Zeff) was inferred from the 70keV monochromatic series. A chemical analyze was performed after expulsion to select cocaine containing packets, and determine their cocaine concentration. Packets filled with other substances than cocaine were excluded from the series. A correlation analysis was performed between HU, Zeff and the percentage of cocaine. This study received the IRB approval.

RESULTS

26 conveyers were included. The mean cocaine content of the packets was 34.5% (SD 14.5%, range 10 to 65%), the mean Zeff was 8.7 (SD 0.7, range 7.7 to 9.9), and the mean radiologic density was 93.8 HU (SD 89.3 HU, range -26 to 307). The cocaine content was strongly correlated with the Zeff ($r=0.78$, p

CONCLUSION

The Zeff of ingested packets, measured by dual energy CT, is closely correlated with their cocaine content. This imaging procedure could help identify conveyers who are at high risk of lethal cocaine poisoning from a packet rupture.

CLINICAL RELEVANCE/APPLICATION

Dual energy CT can estimate the cocaine concentration of illegal intra-corporeal packets. This information might be useful in the management of drug conveyers until complete expulsion of the packets.

LL-ERS-WE2B • Post-mortem Whole Body Computed Tomography of Heroin and Methadone Fatalities: Frequent Findings and Comparison to Autopsy

Sebastian Winklhofer MD (Presenter) ; Eddie Surer ; Garyfalia Ampanozi MD ; Thomas D Ruder MD ; Paul Stolzmann MD ; Andrea Oestreich PhD ; Thomas Kraemer PhD ; Hatem Alkadhi MD ; Michael J Thali MD ; Wolf Schweitzer MD

PURPOSE

Aim of the study was to assess and to analyze frequent findings in whole body postmortem computed tomography (PMCT) in cases of fatal heroin and methadone intoxication.

METHOD AND MATERIALS

Routinely performed whole body PMCT scans of 55 cases (16 women; 39 men; median age 37.9 years) of non-traumatic death, in which heroin and/or methadone had been found responsible for death were retrospectively evaluated (drug group). PMCT data as well as the CT images of an age and sex matched control group ($n=55$, 16 women; 39 men; median age 37.9 years) were analyzed for pathologic findings and imaging results were compared with conventional autopsy results.

RESULTS

Most common findings in the drug-cases were: pulmonary edema (95%), aspiration (66%), distended urinary bladder (60%), cerebral edema (49%), pulmonary emphysema (38%), and fatty liver disease (36%). A significant correlation ($p < .05$) between frequent PMCT findings for the diagnosis of drug associated death compared to the control group was found for brain edema and pulmonary edema, pulmonary emphysema, aspiration, fatty liver disease and distended bladder. The combination of lung edema, brain edema and a full urinary bladder was seen in 14 cases (26%) in the drug group, and none in the control group. Defining those three findings as indicative for drug related death, a sensitivity of 26% and a specificity of 100% were calculated. The sensitivity for detection of pathologic findings in CT compared to autopsy as reference standard showed a wide range from 51% (brain edema) to 95% (pulmonary edema).

CONCLUSION

This study demonstrates characteristic findings of whole body PMCT in cases of fatal heroin and methadone intoxication. The characteristic constellation of brain edema, lung edema and a distended full urinary bladder was highly specific for heroin and methadone associated cases of death. Their combination in PMCT should raise suspicion of intoxication.

CLINICAL RELEVANCE/APPLICATION

Post-mortem whole body CT in cases of heroin and/or methadone intoxication demonstrates characteristic pathologic findings and can be a helpful tool for the daily work of forensic pathologists.

LL-ERS-WE3B • Utility of Post Mortem CT Angiography in Injuries Caused by Falls from Extreme Heights: About Seven Lethal Cases

Fatima-Zohra Mokrane MD (Presenter) ; Frederic Savall MD ; Camille Rerolle ; Antony Blanc ; David Gainza ; Daniel Rouge MD, PhD ; Herve P Rousseau MD ; Norbert Telmon ; Fabrice Dedouit

PURPOSE

Multi Slice Computed Tomography (MSCT) is used in forensic sciences since the last decade, and has proven its efficiency, especially for bone injuries. The use of enhanced multislice computed tomography (MSCT) in forensic sciences has been recently developed in order to improve radiological vascular and organs injuries detection. Seven cases of great height falls had been studied by Multi-phase postmortem computed tomography angiography (MPMCTA). At this occasion, a review of the literature was made in order to compare the observed cases with the actual knowledge, and to establish the contribution of MPMCTA to the forensic purpose.

METHOD AND MATERIALS

Seven suicidal cases of great height falls (4 women, and 3 men) underwent a MPMCTA examination before medico-legal autopsy. The estimated height falls varied from 5 to 15 meters. All corpses were prepared with a surgical cannulation of femoral vessels. After a non enhanced MSCT exploration, a controlled perfusion device was used with paraffin oil mixed with specific contrast agent, allowing three time-different acquisitions (arterial, venous, dynamic). Two radiologists proceeded to images analysis. The forensic pathologist undergoing autopsies knew preliminary imaging results.

RESULTS

Comparisons between MPMCTA and autopsy findings underwent to some differences. MPMCTA was better to diagnose gas, bone fractures, and vascular ruptures. Superficial skin lesions, easily accessible to external examination, were better diagnosed by autopsies. Both techniques were able to diagnose classical bone, visceral and vascular lesions. Furthermore, rare injuries were found in our study. Cases of coronary artery desinsertion, double thoracic aortic rupture, inferior vena cava extensive laceration and pulmonary vein disruption were easily diagnosed by MPMCTA. Even if these lesions were also found during autopsies, MPMCTA allowed better in situ lesions illustration and documentation. Also, practice of different time-acquisitions was essential for understanding abnormal traumatic communication between cardiac cavities.

CONCLUSION

MPMCTA offers a great opportunity to study forensic corpses, especially for traumatic deaths. Also, this new technique allows also a better comprehension of lesions and their chronology in death mechanisms.

CLINICAL RELEVANCE/APPLICATION

Post mortem CT angiography is a complementary technique to autopsy, especially in traumatic cases, like in cases of lethal great height falls.

LL-ERE-WE4B • 'Don't Swallow That!': A Review of Ingested and Inhaled Foreign Bodies in Children and Their Clinical Significance for Radiologists

Brian S Pugmire MD (Presenter) ; Ruth Lim MD * ; Laura L Avery MD

PURPOSE/AIM

This will be an exhibit directed primarily toward radiology trainees preparing for on-call duties in the emergency department with the following aims:

1. Review commonly ingested/aspirated foreign bodies in children.
2. Discuss the appropriate imaging evaluation for a patient suspected of having an ingested or aspirated foreign body.
3. Review the imaging appearance and clinical management of various foreign bodies.

CONTENT ORGANIZATION

1. Focused review of the epidemiology of ingested/aspirated foreign bodies.
2. Focused review of the clinical approach to pediatric patients suspected of having an ingested/aspirated foreign body with a discussion of the appropriate imaging strategy.
3. Case-based imaging review of common foreign bodies including: magnets, batteries, coins, etc. with an emphasis on immediate recognition and the clinical implications of radiographic findings.

SUMMARY

Ingestion and inhalation of foreign bodies by patients (particularly children) is commonly encountered in the Emergency Department. Frequently, the exact foreign body is unknown and the radiologist's recognition of specific foreign bodies may be critical for prompt and appropriate treatment. This exhibit will increase the radiologist's understanding of commonly ingested/aspirated foreign bodies, thus improving their ability to provide appropriate clinical guidance.

LL-ERE-WE5B • Diaphragm-o-rama: A Practical Guide to Diaphragmatic Injury Evaluation in Blunt and Penetrating Trauma

Mark M Hammer MD ; Demetrios A Raptis MD ; Vincent M Mellnick MD ; Christine O Menias MD ; Sanjeev Bhalla MD ; Constantine A Raptis MD (Presenter)

PURPOSE/AIM

In the era of routine MDCT in the setting of trauma, it is incumbent upon the radiologist to recognize diaphragmatic injuries. While the literature describes the association of many imaging signs with diaphragmatic injury, little work has been done in determining which of these signs are more likely to be associated with blunt or penetrating trauma, despite the fact that the features of diaphragmatic injury in these two groups are often very different. The purpose of this exhibit is to review the various signs of diaphragmatic injury and explore their relevance in a cohort of over 90 cases of surgically proven diaphragmatic injury from our Level I trauma center.

CONTENT ORGANIZATION

I. Review of imaging signs associated with diaphragmatic injury:

- ◆ At least 12 signs described in the literature that are specifically associated with diaphragm injury
- ◆ Injuries to other tissues or organs in the setting of diaphragmatic injury
- II. The different imaging presentations of blunt versus penetrating trauma
- III. Improving the radiologist's assessment of the diaphragm in trauma cases

SUMMARY

Understanding the different imaging signs and presentations associated with diaphragmatic injuries in blunt and penetrating trauma cases will improve the radiologist's ability to correctly interpret CT examinations in trauma patients.

RSNA/ESR Emergency Symposium: Chest Emergencies (An Interactive Session)

Wednesday, 01:30 PM - 03:00 PM • S402AB



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MSSR43 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSSR43A • Thoracic Injuries

Stuart E Mirvis MD (Presenter)

LEARNING OBJECTIVES

1) The learner will be able to differentiate traumatic aortic injuries from congenital variants that mimic injury, to distinguish minor from major aortic injuries and to understand how injury classification can influence management. 2) The participant will recognize the various CT appearances suggesting and verifying major airway injury. 3) The participant will understand the various CT appearances of blood/bleeding in the chest and how the location, quantity of blood/bleeding and patient clinical status determine initial treatment. 4) The learner will appreciate the spectrum of cardiac injuries that can be diagnosed on admission contrast-enhanced CT and those that require urgent intervention.

ABSTRACT

MSSR43B • Non-Traumatic Thoracic Emergencies

Cornelia M Schaefer-Prokop MD (Presenter) *

LEARNING OBJECTIVES

1) To get familiar with protocols and diagnostic performance of comprehensive cardiothoracic CT examinations to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and pulmonary embolism. 2) To illustrate typical but also less classic CXR and CT findings of patients with pulmonary or mediastinal diseases causing acute dyspnoea and / or requiring immediate treatment and to learn about key imaging findings in these patients allowing for a fast differential diagnosis. 3) To learn how to adapt CT protocols to CXR findings and to integrate imaging findings with lab findings, patient history and clinical information for making the diagnosis.

ABSTRACT

Pulmonary symptoms such as chest pain, shortness of breath or wheezing are common non-traumatic symptoms prompting ER visits. Because clinical symptoms are very non-specific, imaging plays a major role in differentiating life threatening from less severe diseases and forming a diagnosis. The chest radiograph remains the first imaging despite its limited sensitivity for certain diseases and being prone to inter-observer variability. Comprehensive cardiothoracic CT examinations using most modern CT equipment are well evaluated in their diagnostic accuracy to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and

pulmonary embolism. Protocols, literature evidence and appropriate examples will be discussed. In addition the course will highlight nonvascular emergencies such as mediastinal diseases (e.g., esophageal perforation, mediastinitis or pericarditis) and pulmonary emergencies (e.g., pneumonia, edema, pneumothorax, exacerbation of diffuse lung diseases) for which a more comprehensive consideration of imaging findings, lab findings, patient history and clinical information is needed for making the diagnosis.

MSSR43C • Interactive Case Discussion

Stuart E Mirvis MD (Presenter) ; Cornelia M Schaefer-Prokop MD (Presenter) *

RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)

Wednesday, 03:30 PM - 05:00 PM • S402AB

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MSSR44 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSSR44A • Abdominal Injuries

Andras Palko MD, PhD (Presenter) *

LEARNING OBJECTIVES

1) To explain the significance of injury mechanism and its role in the formation of consequent abdominal lesions and their complications. 2) To outline the role of proper imaging technique and diagnostic algorithm in the sufficiently fast diagnosis of abdominal injuries. 3) To learn more about the typical and unusual findings of various abdominal traumatic conditions.

ABSTRACT

Abdominal injuries require a timely and reliable diagnosis in order to prevent the potentially lethal outcome. The armory of clinical tools (physical examination, lab tests) does not fulfill these criteria, since they are either not fast, or not reliable. Imaging diagnostic modalities help the clinician to acquire the necessary amount of information to initiate focused and effective treatment. However, the selection of the appropriate imaging algorithm, modality and technique, as well as the precise detection and interpretation of essential imaging findings are frequently challenging, especially because the circumstances, under which these examinations are performed (open wounds, bandages, non-removable life-supporting equipment, lack of patient cooperation, etc.), are frequently less than optimal. Knowledge of critical imaging signs, symptoms and the role they play in the evaluation of the patient's condition, but also fast decision-making and ability to closely cooperate with the clinicians are skills of key importance for radiologist members of the trauma team.

MSSR44B • The Enemy Within, Non-Traumatic Abdominal Emergencies

Ronald J Zagoria MD (Presenter)

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia. 3) Attendees will learn the CT findings of common causes of an 'acute' abdomen. 4) Attendees will learn the imaging findings of acute, nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

This segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain. CT findings will be emphasized. Key imaging findings of 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 urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

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 and penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

Controversy Session: The Heart of the Matter: Nuclear Stress Test vs CTA for Low to Intermediate Risk Cardiac Patients with Chest Pain

Wednesday, 04:30 PM - 06:00 PM • S404CD

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SPSC45 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Suhny Abbara, MD *
Sharmila Dorbala, MBBS *

LEARNING OBJECTIVES

1) To review the current literature on cardiac CT in the setting of chest pain with low to intermediate risk. 2) To review the current literature on radionuclide myocardial perfusion imaging in the setting of chest pain with low to intermediate risk. 3) To understand the strengths and weaknesses of radionuclide imaging and MDCT in this particular situation.

ABSTRACT

URL

<http://www.mgh-cardiovascimages.org/>

The Acute Abdomen and Pelvis (An Interactive Session)

Thursday, 08:30 AM - 10:00 AM • E450A

ER GU GI

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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. 3) To highlight the advantages and potential limitations of non-contrast CT of the acute abdomen and pelvis, compared with other CT protocols/other cross-sectional imaging examinations. 4) To briefly review areas of controversy with CT protocols (e.g. appendicitis).

ABSTRACT

RC608C • 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

Emergency Body MRI: Vascular Emergencies, Abdominal Emergencies and the Pregnant Patient (How-to Workshop)

Thursday, 08:30 AM - 10:00 AM • E261

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RC651 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

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 various clinical scenarios as it pertains to 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

Review the MRI imaging features of acute Genitourinary entities such as renal abscess, pyelonephritis and obstructing ureteral stone. Acute Gyn entities include MRI imaging of PID, ovarian torsion, hematomas, and ruptured hemorrhagic cyst. Review the Acute gastrointestinal disorders on MRI such as SBO, mesenteric arterial and venous ischemia, Crohn's, colitis, and Peptic ulcer disease.

Emergency Radiology (Imaging Abdominal Emergencies)

Thursday, 10:30 AM - 12:00 PM • N226

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SSQ05 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator
Douglas S Katz, MD
Moderator
Jamiik-Omari Johnson, MD

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 1cm 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 to 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 ($R=0.963$ and $R^2=0.949$, 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 notified. 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

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 considering all 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.

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 appendicitis 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, intra- and extra-luminal appendicolith, intra- and extra-luminal gas, phlegmon, abscess, and focal enhancing wall defect. 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 viscus (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 Intraluminal 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 (P0.05). 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 FFRCSI ; Rekha Raju ; Shamir Rai BSc ; Sarah A Barrett MBChB ; Charlotte J Yong-Hing MD, FRCPC ; 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 changes in 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

81 consecutive patients underwent contrast enhanced CT abdomen using a dual source 128-slice CT system (Definition FLASH; Siemens Healthcare, Germany). RAW data from detector A of the dual source (A+B) datasets was reconstructed to yield half dose images (AP50) using a validated technique. All images were reconstructed using FBP and a raw data based IR algorithm (SAFIRE). The size and mean Hounsfield unit (HU) of renal hypodensities measuring greater than 1 cm was recorded on AP100-FBP, AP100-IR, AP50FBP and AP100-IR datasets. Hypodensities >20 HU were classified as solid and those between -20 HU and 20 HU was considered simple. AP100-IR images were chosen as the reference standard for the purposes of sensitivity and specificity analysis.

RESULTS

CONCLUSION

When compared to our chosen reference standard, 50% dose images reconstructed with FBP showed superior sensitivity and specificity to those reconstructed with IR for the correct classification of renal hypodensities.

CLINICAL RELEVANCE/APPLICATION

Approximately 20% of renal hypodensities are mischaracterized on the half dose images

SSQ05-08 • Frequency of Previously Reported Ovarian Torsion Findings on Both Ultrasound and Computed Tomography

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 torsed 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 or marked 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 torsed ovary.

RESULTS

Of the 20 torsed ovaries, 55% were on the right and 45% on the left. An underlying mass was identified in 60%. Mean torsed ovarian diameter was 7.4 cm (range, 5.0-20.0 cm). Mean volume was 416 mL (range, 29-1842 mL). Thus 100% of torsed 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 torsed ovaries by US (vs. 60% by 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 torsed 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 Bahhar 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 folds 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 patient's 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.

ASRT@RSNA 2013: Elbow and Forearm Trauma: Mechanisms of Injury and Patterns of Fractures

Thursday, 10:40 AM - 11:40 AM • N230



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MSRT53 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Ken L Schreibman, MD, PhD

LEARNING OBJECTIVES

1) Review the anatomy of the elbow joint in three dimensions. 2) Demonstrate the standard radiographic views of the elbow. 3) Discuss techniques for performing CT of the elbow. 4) Illustrate that the forearm is a ring, and show how specific mechanism of injuries yield specific fracture patterns. 5) Teach the four keys to looking at elbow radiographs.

ABSTRACT

Designed for non-radiologists and radiologists alike, this course explores elbow and forearm trauma, using multicolored 3-D images as well as dynamic illustrations. After reviewing the anatomy of the elbow joint, the presentation will show how this anatomy can be optimally imaged, both radiographically and with CT. Using a model of the forearm as a ring, the lecture will demonstrate how one common mechanism, the Fall on Palm Heel (FOPH), can cause a variety of fracture patterns, depending on how the forces travel up the forearm. This model will be used to illustrate and differentiate the classic forearm fractures, including both bone forearm fracture, Monteggia, Galeazzi and Essex-Lopresti. The presentation also will focus on the elbow joint, illustrating the radiographic appearance of common elbow injuries in adults and children, including non-displaced radial head supracondylar, lateral condylar, and medial epicondylar fractures. The 4 Keys to assessing elbow radiographs are emphasized throughout the talk:

- 1) The radial head always points to the capitellum.
- 2) Fat pads are your friends.
- 3) The anterior humeral line passes through the middle third of the capitellum.
- 4) When in doubt, get the other side.

**LL-ERS-THA • AMA PRA Category 1 Credit™:0.5****Host**
Jamlik-Omari Johnson, MD**LL-ERS-TH1A • Timelines in Diagnosis and Management of Acute Ovarian Torsion: Can We Do Better?****Hournaz Ghandehari MD (Presenter) ; Phyllis Glanc MD****PURPOSE**

The analysis of timelines in the diagnosis and management of surgically treated ovarian torsion may result in information leading to optimization of the timelines. This may help identify the points in the timeline where a shorter time interval would ultimately result in improved ovarian preservation rates.

METHOD AND MATERIALS

Charts of patients with surgically proven adnexal torsion over 12 years were retrospectively reviewed. Timelines for the following points were obtained: Triage in Emergency Room (ER); assessment by ER physician; performance of the imaging study and time to Operating Room (OR). Descriptive statistics for each of waiting times were computed including mean, median and 95% confidence interval for the mean and median. We computed the cumulative distributions of waiting and the percentage of each patient's waiting time in each interval.

RESULTS

Of 86 surgically proven adnexal torsion cases, 63 (73%) had documentation of all timelines and were included in the study. Mean patient age was 33.7 years (15 years to 63 years, ± 1.5 SEM). Pathology was overwhelmingly benign (98%). In 34 cases (54%) the adnexa was detorsed successfully and the remaining 29 cases (46%) underwent adnexal removal due to non-viability.

Mean and median times for :

- ◆ ER admission to assessment by ER physician was 1.9 and 1.3 hours
- ◆ ER physician assessment to imaging was 5.5 and 3 hours
- ◆ Imaging to OR was 15 and 6.8 hours.

There was a significant difference between mean and median times for overall journey from ER to OR in the group where the adnexa was salvaged (15.2 and 10 hours) and the group where the adnexa was removed (30.8 and 22.1 hours) [$p= 0.02$].

CONCLUSION

In patients presenting with clinical signs and imaging features suspicious for adnexal torsion, longer overall time of the journey from ER to OR leads to lower rates of adnexal salvage. The longest individual time interval in our study is the time from imaging to OR. Optimizing this step would likely lead to increased ovarian salvage rates.

CLINICAL RELEVANCE/APPLICATION

;;Although it is known that the effect of time is directly related to the outcome in the torsed ovary, the results of this study identify delaying step/steps for optimization of timelines for this gro

LL-ERS-TH2A • Usefulness of Contrast-enhanced Ultrasound (CEUS) in the Diagnosis of Acute Gangrenous Cholecystitis: A Comparative Study with Surgical and Pathological Findings**Tomas Ripolles MD (Presenter) ; Maria Jesus Martinez Perez ; Jordi Blay Beltran MD ; Lidia J Navarro MD ; Rosario Martinez-Garcia MD ; Encarna Marti-Ibor ; Gregorio Martin-Benitez ; Jose Vizuete****PURPOSE**

To determine the usefulness of contrast-enhanced US (CEUS) for the diagnostic assessment of acute gangrenous cholecystitis, compared with pathologic specimens as gold standard.

METHOD AND MATERIALS

From December 2011 to March 2013, all patients with a clinical and sonographic diagnosis of acute cholecystitis subsequently underwent a CEUS examination. An original CEUS diagnosis of gangrenous cholecystitis was made when discontinuity of gallbladder wall enhancement was seen after contrast agent injection. B-mode sonographic findings prospectively evaluated were: wall thickness, biliary sludge, lithiasis, Murphy sign, wall striations, intraluminal membranes, wall interruption, pericholecystic fluid, or mural hyperemia. In the analysis we included only patients who underwent cholecystectomies within 24 hours after CEUS. Sonographic diagnosis was compared with the pathologic analysis of the gallbladder specimen. Sensitivity, specificity, positive and negative predictive values, and accuracy of CEUS were calculated. Retrospectively, two experienced radiologists reviewed video sequences to calculate the interobserver agreement in assessing the detection of parietal enhancement defects on CEUS, using the kappa statistics.

RESULTS

64 patients were included in the study (32 women, mean age of 71 years). The final pathological diagnoses were 6 chronic cholecystitis, 10 acute cholecystitis and 48 acute gangrenous cholecystitis. Local or widespread absence of gallbladder wall enhancement on the preoperative CEUS image was accurately associated with the presence of pathologically confirmed gangrenous acute cholecystitis (sensitivity, specificity and accuracy of 79,2%, 81,3% and 79,7%, respectively). The interobserver agreement for detection of mural defects of enhancement was good (k value: 0,719). The radiologic criteria with the highest sensitivity and specificity to gangrenous form were defects of enhancement, wall striations and biliary sludge. Presence of intraluminal membranes had high specificity (92,8%) but low sensitivity (22,9%) for detection of gangrenous cholecystitis.

CONCLUSION

Local or widespread absence of gallbladder wall enhancement on CEUS is associated with the presence of gangrenous acute cholecystitis.

CLINICAL RELEVANCE/APPLICATION

Preoperative diagnosis of gangrenous cholecystitis is difficult. However, early diagnosis and emergent intervention are critical because it is associated with an increased morbidity and mortality.

LL-ERS-TH3A • Intraluminal Gas in Non-perforated Acute Appendicitis: A Predictor of Gangrenous Appendicitis**Diana M Plata Ariza (Presenter) ; Elena Martinez Chamorro ; Daphne Castano ; Marta Arroyo ; Esteban Peghini ; Susana Borrueal MD****PURPOSE**

- To determine if the presence of gas within the appendix at CT in the context of proven appendicitis correlates with a gangrenous appendix by using pathologic/surgery examination as the reference standard.
- To compare the differences in length of hospital stay between the groups of phlegmonous and gangrenous appendicitis as an indicator of hospital costs

METHOD AND MATERIALS

We retrospectively reviewed the charts of 1249 adult patients with pathologically proven appendicitis (January 2009 to September 2012). From this group 197 patients had been examined by MDCT before surgery. 93 patients with findings of perforated appendicitis were excluded.

A 16-detector CT scanner was performed. Intravenous non-ionic contrast media was administered to 88 patients, oral contrast to 8 and rectal contrast to 1. 104 MDCT-scans were reviewed and classified in two groups depending on the presence of air in the appendix after a consensus by 2 senior radiologists and 1 resident. Results were compared to surgical/pathological reports looking for a gangrenous or phlegmonous appendix. Then we reviewed the length of hospital stay by groups and the results were analyzed by comparing the mean hospital stay with the pathology outcome. Odds ratios sensitivity, specificity and predictive values with 95% confidence intervals for intraluminal gas as sign of gangrenous appendicitis were determined. Statistical analysis used Fisher's exact test.

RESULTS

Gangrenous appendicitis was present in 21 of the group of 25 patients with non-perforated appendicitis that contained gas, whereas such finding was present in 7 patients of the 79 without intraluminal gas (84% vs 9%, $p < 0.0001$). The presence of intraluminal gas showed an odds ratio for gangrenous appendicitis of 54 (12-262), a 75% (60-84%) sensitivity, a 94% (89-98%) specificity and a positive likelihood ratio of 14.2 (5.5-42.8). The mean hospital stays were 2,5 and 5 days for phlegmonous and gangrenous appendicitis, respectively.

CONCLUSION

In patients with CT signs of non-perforated appendicitis the presence of gas within the appendix strongly suggests gangrenous appendicitis. Length of hospital stay is longer in gangrenous appendicitis and may generate higher hospital costs.

CLINICAL RELEVANCE/APPLICATION

Gangrene is a step prior to perforation, with higher morbidity and longer hospitalization time. CT signs of gangrene help surgeons to avoid delays in surgery, complications and a longer hospital stay

LL-ERS-TH4A • Noncontrast MRI versus Contrast Enhanced CT for Evaluation of Suspected Acute Appendicitis in Patients ≤ 40 Years: Cost Considerations and Impact on Emergency Department Patient Throughput

Matthew Covington MD (Presenter) ; Shannon Urbina ; Elizabeth A Krupinski PhD ; Lori Stolz MD ; Diego R Martin MD, PhD ; Surya Chundru MD ; James R Costello MD, PhD ; Bobby T Kalb MD

PURPOSE

To compare the effects of noncontrast MRI vs contrast-enhanced CT utilization for ED patients with right lower quadrant pain, with attention on patient throughput and comparative total abdominal imaging costs during the same ED visit.

METHOD AND MATERIALS

This study was IRB-approved and HIPAA compliant. Inclusion criteria included all patients at our institution = 40 years presenting to the ED during daytime hours, who underwent noncontrast MRI or IV contrast-enhanced CT as the primary imaging method for evaluation of acute appendicitis between 8-2012 and 3-2013. Exclusion criteria included patients > 40 years, patients presenting after daytime hours and patients without clinical concern for acute appendicitis. MRIs utilized a fast, no oral/no intravenous contrast protocol, including a combination of multiplanar non-breath-hold, Half Fourier Acquisition Single Shot Turbo Spin Echo (HASTE) sequences +/- fat saturation utilizing a spectral adiabatic inversion recovery (SPAIR) technique. CTs were performed on a 64 slice scanner with IV contrast but no oral contrast. Data collected included time from ED triage to disposition (admit or discharge) and total number of imaging examinations performed during the ED stay. Cost-figures for each imaging modality and ancillary imaging tests were determined utilizing regional Medicare rates. A t-test was used to compare results between CT and MRI ($p = 0.05$ considered significant).

RESULTS

There were 33 patients in the MRI cohort and 42 patients in the CT cohort. Noncontrast MRI was associated with a significant reduction in ED length of stay compared to IV contrast-enhanced CT (560 min vs. 685 min, $p=0.04$). MRI patients had fewer ancillary imaging exams compared to CT (0.42 and 0.79 per patient, respectively, p

CONCLUSION

Evaluation of acute appendicitis with noncontrast MRI resulted in a significant reduction in the number of imaging tests performed and length of stay in the ED, compared to IV contrast-enhanced CT.

CLINICAL RELEVANCE/APPLICATION

Improved ED throughput and reduced number of imaging tests may offset additional MR imaging costs for patients with suspected appendicitis undergoing noncontrast MRI compared with contrast-enhanced CT

LL-ERE-TH5A • Globe and Orbital Trauma. A Quiz Case Based Review of Patterns of Injury

Eleni Testempassi MD (Presenter) ; Vasiliki Vantali MD ; Stylianos V Benakis MD ; Ioannis Matsiras ; Andreas Simopoulos MD, MSc ; Dimitrios Chondros

PURPOSE/AIM

Eye and orbital trauma is not an uncommon situation in the emergency room and in multi-trauma patients. The purpose of this exhibit is to illustrate the ocular and orbital traumatic lesions and review the roles of computed tomography, magnetic resonance imaging ultrasound and plain radiography in the evaluation of eye and orbital trauma.

CONTENT ORGANIZATION

A brief review of normal eye and orbit anatomy is presented. Common and uncommon traumatic ocular and orbital pathology, blunt and penetrating trauma are illustrated in a quiz format. Soft tissues, anterior chamber, lens, retina, retrobulbar space, intraocular and extraocular foreign bodies, orbital bones, vessels, optic nerve and finally intracranial injuries associated with visual disturbances are estimated and depicted.

CT is considered the imaging modality of choice in orbital trauma. Practical guidelines for examination of choice and examination protocols for emergency and routine examinations are presented.

SUMMARY

Rapid assessment and examination following trauma to the eye is crucial. A thorough knowledge of potential injuries is imperative to ensure rapid diagnosis, to prevent further damage to the eye and to preserve visual capacity. Imaging, in combination with ophthalmologic examination, can be powerful tool to the evaluation of traumatic injury of the eye.

Emergency Radiology -Thursday Posters and Exhibits (12:45pm - 1:15pm)

Thursday, 12:45 PM - 01:15 PM • Lakeside Learning Center



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LL-ERS-THB • AMA PRA Category 1 Credit™:0.5

LL-ERS-TH1B • Increased Ultrasound Visualization of the Appendix and Decreased CT Utilization Following Implementation of Coronal Plane Scanning in the Left Posterior Oblique Position and Repeat Scanning in the Supine Position for Suspected Appendicitis

Stephanie T Chang MD (Presenter) ; R. Brooke Jeffrey MD * ; Eric W Olcott MD

PURPOSE

When the appendix was not visualized on supine graded compression ultrasound imaging, we began performing coronal imaging in the left posterior oblique position to identify a retrocecal appendix. If the appendix was still not visualized, we repeated scanning in the supine position. We determined the change in ultrasound visualization rates of the appendix and subsequent CT utilization rates following implementation of these additional ultrasound maneuvers on June 1, 2012.

METHOD AND MATERIALS

All ultrasound studies of the appendix were reviewed to determine the number of cases in which of the appendix was identified between January 1, 2012-May 31, 2012 (period 1) and June 1, 2012-January 31, 2013 (period 2). All CT scans performed within 5 days after completed ultrasound studies were also recorded. Statistical analysis was performed using Fisher's exact test.

RESULTS

A total of 944 ultrasound studies of the appendix were reviewed (353 in period 1, 591 in period 2). Patients in periods 1 and 2 did not significantly differ by gender or age. There were 105 and 188 female pediatric patients, 106 and 181 male pediatric patients, 110 and 187 female adult patients, and 32 and 35 male adult patients in periods 1 and 2, respectively. The median age was 14 years in both periods with a range of 0.3-81 years and 0.3-87 years in periods 1 and 2, respectively.

The average ultrasound visualization rate of the appendix significantly increased from 33.7% (119/353) to 49.4% (292/591) between periods 1 and 2 (p Ultrasound accounted for 70.6% (36/51) of all imaging diagnoses of appendicitis during period 1 and 86% (86/100) during period 2, which was significantly increased ($p=0.029$).

CONCLUSION

Implementation of additional ultrasound protocol maneuvers significantly increased visualization rates of the appendix and the proportion of imaging-based diagnoses of appendicitis made by ultrasound, significantly decreasing the rate of subsequent CT scans performed.

CLINICAL RELEVANCE/APPLICATION

Coronal scanning in the left posterior oblique position and repeat supine scanning can significantly increase ultrasound visualization rates of the appendix and decrease utilization of CT scans.

LL-ERS-TH2B • MDCT Evaluation of Bowel Obstruction: Can the Radiologist's Experience Make a Difference?

Raffaella Basilico MD (Presenter) ; Nicoletta Civitareale MD ; Manuela Mereu MD ; Annarita Ferri MD ; Alessandra Lella MD ; Andrea Delli Pizzi MD ; Eleonora Di Campli MD ; Antonio R Cotroneo MD

PURPOSE

To evaluate the diagnostic performance of MDCT in the detection of site and cause of bowel obstruction and in the diagnosis of bowel wall ischemia or infarction, by comparing three readers with different experience

METHOD AND MATERIALS

The MDCT examinations of 130 patients with surgical and histological diagnosis of bowel obstruction were retrospectively analyzed by three readers with different experience in abdominal disease: abdominal radiologist, general radiologist and a third year resident. For each reader we calculated the CT concordance with pathology results and the MDCT diagnostic accuracy in the evaluation of the cause and the site of obstruction and in the detection of bowel wall ischemia or infarction. For the latter parameter, the sensitivity and specificity values as well as PPV and NPV were also determined.

RESULTS

The causes of bowel obstruction were: adhesions (36,3 %), neoplasms (22,7%), hernias (13,6%), volvulus (12,5%), other causes (14,7%). The CT concordance with pathology in determining the cause of bowel obstruction was statistically significant for all readers (0,77, 0,78 and 0,74 respectively) with diagnostic accuracy values of 83%, 83% and 66,6%. The diagnostic accuracy in defining the site of obstruction was 90%, 83% and 78%, being the proximal ileum the most difficult portion of the bowel to identify as the site of obstruction. The sensitivity, specificity, PPV and NPV in identifying bowel wall ischemia or infarction were significantly higher for the abdominal radiologist than the other two readers (80%, 100%, 100%, 93%% for reader 1, 50%,93%,67%,87% for reader 2, 50%, 82%, 50%, 82% for reader 3).

CONCLUSION

MDCT is accurate in diagnosing the cause and the site of bowel obstruction, although a specific training would be preferable for residents. The MDCT evaluation of bowel wall ischemia or infarction is influenced by the radiologist's experience in abdominal disease probably because an abdominal radiologist is able to better detect subtle CT findings of bowel ischemia than general radiologists or residents.

CLINICAL RELEVANCE/APPLICATION

MDCT is accurate in diagnosing the cause and the site of bowel obstruction. The radiologist's experience in abdominal disease represents an added value in the diagnosis of bowel wall ischemia

LL-ERS-TH3B • Acute Cholecystitis Caused by Radiolucent Stone or Sludge: Roles of Ultrasonography (US) and Magnetic Resonance Cholangiography (MRC)

Meehyun Park (Presenter) ; Hye-Suk Hong ; Ji Young Woo MD ; Yul Lee MD ; Ik Yang MD ; Ah Young Jung ; Yoo Na Kim ; Ji Young Hwang MD ; Su Kyung Jeh

PURPOSE

To investigate roles of US and MRC for diagnosing acute cholecystitis when gallstones are not visible on CT.

METHOD AND MATERIALS

During a 3-year period, we retrospectively collected abdominal CT of consecutive 590 patients with surgically confirmed acute cholecystitis. CT scans were evaluated in terms of visualization of gallstones and 104 cases with no visible gallstones at CT were further investigated. Of the 104 patients, 76 (M:F=38:38; age, 18-89 years) had US (n=49), MRC (n=47), or both (n=20) before surgery and were enrolled as a final study population. Two reviewers performed image analysis in consensus. In terms of evaluating acute cholecystitis at CT, reviewers diagnosed each case as one of the followings: definitely not, suspected of acute cholecystitis, or definitely acute cholecystitis. US and MRC images were analyzed in terms of the presence of obstructing stone or sludge in the gallbladder. On US and MRC, cases were diagnosed as either no cholecystitis or acute cholecystitis. Surgical and pathologic records were used as reference standard for the presence of stone or sludge in the gallbladder and for the final diagnosis. Accuracy in detecting stone or sludge in the gallbladder was compared between US and MRC using the Chi-square test. Sensitivity in diagnosing acute cholecystitis was calculated and compared between US and MRC using the Fisher's exact test. A p value of less than 0.05 was considered statistically significant.

RESULTS

In CT diagnosis of acute cholecystitis, there were 2 cases of definitely not, 54 of suspected of acute cholecystitis, and 20 of definitely acute cholecystitis. The accuracy in detecting gallstone or sludge was not significantly different between US and MRC (84% vs 91%) ($p=0.247$). The sensitivity of MRC in diagnosing acute cholecystitis was significantly higher than that of US for total population (87% vs 71%, $p=0.048$) and for 54 patients with suspected of cholecystitis at CT (91% vs 72%, $p=0.036$).

CONCLUSION

US and MRC were comparable in the detection of obstructing gallstone or sludge when acute cholecystitis was suspected or indicated at CT without visible gallstones. MRC showed higher sensitivity in diagnosing acute cholecystitis than US.

CLINICAL RELEVANCE/APPLICATION

When acute cholecystitis is initially suspected but not conclusive at CT without visible gallstone, MRC is more sensitive as a confirmative imaging tool compared with US.

LL-ERS-TH4B • Emergency Contrast-enhanced Ultrasonography for Pancreatic Injuries in Blunt Abdominal Trauma

Faqin Lv (Presenter) ; **Jie Tang** ; **Yukun Luo MD** ; **Yongkang Nie MD, PhD** ; **Tanshi Li**

PURPOSE

The portability of CEUS makes it a good tool in trauma settings because examinations can be performed quickly at a patient's bed-side and benefits patients with either stable or unstable hemodynamics. The purpose of this study was to investigate the application of emergency contrast enhanced ultrasonography (CEUS) in blunt pancreatic trauma.

METHOD AND MATERIALS

28 patients with suspected blunt pancreatic trauma were examined by CEUS from March 2007 to June 2012. The findings of CEUS were compared with those of contrast computed tomography (CT) scans.

RESULTS

Out of the 28 patients, 21 were diagnosed with blunt pancreatic injury by using CEUS, including 8 patients with lesion in the neck of pancreas, 9 in the body of pancreas, 3 in the tail and 1 in the head. The injury sites appeared as anechoic and/or hypoechoic perfusion defect regions with irregular borders in parenchyma and capsule on CEUS images. The lesion sizes measured by the CEUS were (1.88 ± 0.81) cm, which were consistent with (1.93 ± 0.77) cm measured by CT ($P > 0.05$). The accuracy, sensitivity and specialty of CEUS in diagnosing blunt pancreatic trauma were 89.3%, 90.9% and 83.3% respectively
Figure 1: Conventional US, CEUS and CECT images in a 51-year-old man involved in a serious traffic accident.

CONCLUSION

CEUS findings can be used to provide reliable diagnosis for blunt pancreatic trauma. CEUS is thus a promising tool in the assessment of blunt pancreatic trauma, especially in institutions where emergency CEUS is used as an initial diagnostic instrument.

CLINICAL RELEVANCE/APPLICATION

CEUS is convenient in trauma rescue. It, if performed appropriately and timely, is helpful and reliable in diagnosing and defining the severity of pancreatic injuries.

LL-ERE-TH5B • Update on Imaging of Acute Pancreatitis: What the Radiologist Needs to Know

Leena Tekchandani MD (Presenter) ; **Ritu Bordia MBBS** ; **Lewis Shin MD** ; **Giovanna Casola MD** ; **James Grendell** ; **Douglas S Katz MD** ; **Bruce R Javors MD**

PURPOSE/AIM

To review the current status of imaging of acute pancreatitis for the emergency and general radiologist, with an emphasis on the role of CT and the revised Atlanta Classification System.

CONTENT ORGANIZATION

The exhibit will cover the latest literature on, and will demonstrate with imaging examples from several institutions: - pathogenesis and clinical presentation of acute pancreatitis - diagnostic criteria per the revised Atlanta Classification - indications for imaging and technical considerations - clinical systems for predicting severity - Balthazar/CT severity index - emphasis will be placed on CT and the revised Atlanta Classification System - with explanation of new terminology (e.g. WON, walled-off necrosis; APFC - acute peripancreatic fluid collection; ANC - acute necrotic collection) - review of US and MR findings - imaging of complications (e.g. splenic venous thrombosis; hemorrhage; pseudoaneurysm; fistula; disconnected pancreatic duct) and less common presentations (e.g. acute on chronic; underlying neoplasm; groove; autoimmune) - potential imaging pitfalls - prognosis and treatment

SUMMARY

After review of this exhibit, the emergency and general radiologist will be more familiar with the latest concepts in imaging of acute pancreatitis, particularly the new terminology of the Atlanta Classification and how to report the CT findings.

Non-Traumatic Neuro Emergencies

Thursday, 04:30 PM - 06:00 PM • E451A



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RC705 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC705A • Non-traumatic CNS Hemorrhage

Patrick A Turski MD (Presenter) *

LEARNING OBJECTIVES

1) At the end of this lecture the participant should be able to recognize the variable appearance of parenchymal and subarachnoid hemorrhage on CT/CTA and MRI/MRA imaging. 2) In addition, the learner should be able to provide a differential diagnosis based on imaging characteristics and location. 3) The clinical examples will also include cases that allow the learner to become familiar with the complications of non traumatic intracranial hemorrhage.

ABSTRACT

The lecture begins with an overview of the common causes of non-traumatic intracranial hemorrhage. The pathophysiology of hypertensive hemorrhage is discussed followed by a series of examples demonstrating the classic locations and appearance on CT and MR imaging. The presentations of aneurysmal and non aneurysmal subarachnoid hemorrhage will be reviewed with emphasis on the evaluation of vasospasm using CTA and CT perfusion imaging. Vascular malformations are discussed by using clinical cases that show hemorrhages from feeding artery aneurysms, intra-nidal aneurysms and venous outflow obstruction/thrombosis. Advanced 4D MRA techniques are introduced that use compressed sensing, under-sampling, and constrained reconstruction to provide time resolved whole brain images to aid in the diagnosis and characterization of intracranial hemorrhage. To complete the review, additional examples of hemorrhage from vasculitis, amyloid angiopathy and neoplastic diseases are presented.

RC705B • Emergency CNS Infections

Turgut E Tali MD (Presenter) *

LEARNING OBJECTIVES

1) Select and apply proper imaging technics and modalities. 2) Identify the basic imaging findings of the CNS infectious diseases. 3) Understand important clues for differential diagnosis. 4) Develop an overall perspective concerning image-guided procedures.

ABSTRACT

Central nervous system (CNS) infections remain as an important cause of morbidity and mortality worldwide. Altered immune status due to HIV infection, immunosuppressive therapies, the increase in international travel and widespread use of antibiotics contribute the emergence of CNS infections. Patient demographics (age/immune status), the pace of the clinical presentation (altered mental status or focal neurologic findings) and laboratory data are the main determinants when evaluating CNS infections. Rapid diagnosis and initiation of appropriate therapy are at utmost importance for patient outcome. CNS infections that commonly present in urgent care settings include meningitis, cerebritis, encephalitis, spinal epidural abscess and subdural empyema. Meningitis is an acute or chronic inflammatory

infiltrate of the meninges and CSF. Most cases are caused by acute pyogenic infections. However, meningitis can also be acute lymphocytic (viral) or chronic. Streptococcus pneumoniae and Neisseria meningitidis are the most common responsible agents in adults, whereas group B beta hemolytic streptococcus and gram-negative enteric microorganisms are the most prevalent agents in newborn in developed and developing countries, respectively. CT is commonly used as a screening test in patients with a suspicion of meningitis. MRI is the imaging modality of choice for the diagnosis of acute manifestations, and secondary complications, as well as treatment monitoring. Unenhanced MR examinations of patients with early meningitis may be unremarkable. The purulent exudates of acute meningitis are isointense with underlying brain that give rise to a 'dirty' appearance on T1WI. On FLAIR, the exudates do not suppress and hyperintensity on FLAIR is a typical but nonspecific finding of acute meningitis. Purulent exudates usually are restricted in diffusion on DWI. Postcontrast images demonstrate intense and uniform meningeal enhancement. Imaging also plays a major role to demonstrate the development of complications, including infarction, cerebritis, abscess, subdural empyema or effusion, hydrocephalus, ventriculitis, myelitis and vasculopathy. Cerebritis is poorly localized perivascular inflammatory infiltrations with minimal scattered necrosis, edema, and petechial hemorrhage. Most are caused by a hematogenous spread of a remote infection, whereas some cases may be caused by otomastoid infections or direct inoculation. Cerebritis are usually bacterial in origin but they can also be fungal, parasitic or granulomatous. Cerebritis in newborn and infants differs from the adults. They are relatively larger in size with relatively poor capsule formation and typically originate in the periventricular WM. There are four stages in the evolution of a cerebritis: early cerebritis, late cerebritis, early capsule, late capsule. Imaging findings vary according to the stage. MRI shows surrounding edema, mass effect, capsule (thicker rim border near cortex, thinner near ependyma) hypointense on T2WI, hyperintense on T1WI with central necrotic area, satellite lesions, daughter rings, petechial hemorrhage, heterogeneous enhancement of the rim, restricted diffusion on DWI with high signal intensity while ADC maps show low signal at the corresponding areas. MRS shows lactate and amino acids. Ventriculitis occurs most likely due to rupture of a brain abscess into the ventricles. Rapid recognition and intervention are very important to treat this lethal condition. Irregular ventricular debris that is hyperintense on T1WI and hypointense on T2WI is typical. There is ependymal enhancement in 60% of the cases.

Subdural empyema is a surgical emergency, which is defined as purulent fluid collection between the dura and arachnoid membranes. It can be secondary to bacterial meningitis in infants and young children. In older children and adults, the subdural empyema usually occurs secondary to the extension of paranasal sinus infection. MRI shows hyperintense extra-axial crescentic fluid collections compared to CSF on T1WI. They are iso-to hyperintense to CSF on T2WI and are hyperintense on FLAIR. There is diffusion restriction on DWI and peripheral enhancement on post-contrast images. Acute encephalitis are diffuse parenchymal inflammatory diseases. They can also involve the meninges. There are many responsible agents, including HSV 1, HHV 6, VZV, Rabies, JC virus, HIV, Papovavirus, Flavivirus, Arbovirus, Enterovirus, Toxoplasma, fungi, Listeria, Rickettsia, Borrelia. Slow virus encephalitis as SSPE, Rasmussen, Prion disease. Herpes simplex encephalitis is caused by DNA virus HSV-1 in more than 95% of the cases. Mortality is high with significant morbidity. There is predilection for limbic system (the anterior and medial temporal lobes, insular cortex, cingulum, subfrontal region). It is unilateral initially and progresses to bilateral in the advancing stage and causes hemorrhagic, necrotizing encephalitis. MRI shows gyral edema with hypointensity on T1WI, high signal on T2WI, mass effect, patchy enhancement, petechial hemorrhages. The basal ganglia are usually spared. Despite vaccination, VZV still causes neurologic problems in clinical practice, including Bell's palsy, Ramsay-Hunt syndrome, meningitis, encephalitis, myelitis, Reye syndrome, and postherpetic neuralgia. Meningitis is the most common presentation in immunocompetent individuals. Encephalitis is the second most common presentation. Acute disseminated encephalomyelitis is seen in 8% of the cases. Cerebellitis is common with diffuse cerebellar swelling and hyperintensities on T2WI/FLAIR images. Enhancement is variable. Restriction on DWI is common. Rabies encephalitis is caused by a neurotropic RNA virus of the Rhabdoviridae family and is a rapidly progressing fulminant disease remaining to be a significant health problem in developing countries. Basal ganglia, thalami, hippocampi and brain stem are the main sites of involvement. MRI demonstrates hyperintensities in the affected regions. Hemorrhage and enhancement are usually West Nile virus (WNV) is a mosquito-borne Flavivirus, leading to periodic epidemics of febrile illness and encephalitis. WNV is now the most common cause of epidemic meningoencephalitis in North America. Most of the infected patients are asymptomatic. Less than 1% of patients develop neurologic disease, manifesting as meningitis, encephalitis, and acute poliomyelitis. Bilateral involvement in the basal ganglia, thalami and brain stem is typical. Central to the practice of emergency medicine is to identify the patients that would benefit from immediate treatment and intervention. Regarding CNS infections, imaging findings should always be evaluated with clinical data and laboratory findings.

RC705C • ENT Emergencies-Cases NOT to Miss!

Wendy R Smoker MD (Presenter)

LEARNING OBJECTIVES

1) Recognize traumatic, infectious, and vascular pathologies that acutely compromise vision. 2) Identify infections in various 'spaces' of the neck (masticator, carotid, pharyngeal mucosal [peritonsillar abscesses], parapharyngeal) that may compromise the airway. 3) Identify acute traumatic and inflammatory lesions affecting the temporal bone. 4) Recognize acute vascular injuries of the neck.

ABSTRACT

The category of ENT emergencies encompasses a variety of pathologies, only a few of which can be addressed in the time allotted. This discussion will focus on: 1) Pathology (potentially) affecting vision acutely and including orbital trauma, orbital infections, and carotid cavernous fistulas 2) Infections that may compromise the airway including masticator space, peritonsillar, retropharyngeal and parapharyngeal abscesses, Ludwig angina, and necrotizing fasciitis. 3) Traumatic hematomas affecting the retropharyngeal and perivertebral spaces 4) Temporal bone infections (petrous apicitis, Bezold abscess...) and traumatic injuries (fractures affecting the facial nerve canal, cochlear hemorrhage,) 5) Vascular emergencies such as impending 'blow-out' lesions

Emergency Musculoskeletal Radiology: The Usual (and Unusual) Suspects

Thursday, 04:30 PM - 06:00 PM • E350



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RC708 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC708A • Noncardiac Chest Pain: Musculoskeletal Causes

Joseph S Yu MD (Presenter)

LEARNING OBJECTIVES

1) Discuss musculoskeletal conditions that may present with chest pain. 2) Review appropriate imaging algorithm for different processes. 3) List differential diagnosis for location-specific sources of pain.

ABSTRACT

Non-cardiac chest pain is a symptom that is frequently encountered in medicine. It tends to elicit a long list of differential diagnoses. The vast majority of people who present with chest pain do not have pathology related to the musculoskeletal system. Occasionally, however, the sternum, clavicles, and ribs along with their articulations may be an unsuspected source of pain. Initial assessment of the thorax begins with a routine radiographic series of the chest. Properly exposed upright PA and lateral radiographs made in full inspiration are often sufficient, but in certain instances, these projections may not allow adequate visualization of the osseous anatomy owing to the superimposition of structures with the mediastinal soft tissues or an incomplete depiction of the contour of the bones, such as the ribs and sternum. As such, a more tailored approach may be required, utilizing cross-sectional imaging modalities such as computed tomography (CT) and magnetic resonance (MR) imaging for evaluating pathologic processes that affect the sternum and sternoclavicular joints, or a dedicated bone-detail rib series for evaluation of the ribs. Occasionally, a coned-down fluoroscopic or radiographic evaluation is adequate, such as a lateral view of the sternum for a dislocation. Scintigraphic examinations such as bone scintigraphy, gallium scanning, and white blood cell scanning are efficacious for assessing metabolic processes that increase bone turnover or produce an inflammatory response. In this course, a differential diagnosis for painful noncardiac and extrapleural conditions of the chest will be discussed including fractures and dislocations, stress fractures, arthritis, costochondritis, sternocostoclavicular hyperostosis, condensing osteitis, infection, muscle tears, and tumors.

RC708B • Acute Hip Pain in the ED: Fracture and Beyond

Bharti Khurana MD (Presenter)

LEARNING OBJECTIVES

1) To provide an understanding of the proximal femoral and pelvic fractures. 2) Describe the multi modality approach to acute hip pain in the Emergency Department. 3) Review the critical findings relevant to orthopedic surgeons for managing these fractures and avoid potential complications.

ABSTRACT

Hip fracture is a common injury with current incidence exceeding 250,000 per year in the United States. The incidence is increasing with increase in life expectancy and elderly population. A prompt diagnosis of hip fracture is important since morbidity and mortality increases as time elapses from the original injury. A thorough knowledge of anatomy, normal variations, pathophysiology and morphologic types of fractures can increase the sensitivity and specificity of plain radiographs and cross sectional imaging in detecting these injuries. Although radiography has been reported more than 90% sensitive in detecting fracture, 2-11% of ED patients harbor radiographically occult fractures. Detection of fracture on MRI is based on presence of marrow edema around the fracture site and does not rely on cortical or trabecular displacement. Awareness of treatment principles and potential complications will help radiologists in improving the value of their service to orthopedic colleagues. Other causes of acute hip pain include muscle injuries, infection, neoplasms, transient osteoporosis, osteonecrosis and rapidly progressive osteoarthritis. Abbreviated MRI protocols are helpful in the ED. A checklist for a systematic approach is critical for the radiologists interpreting these studies in ED to avoid potential misses and pitfalls.

RC708C • Radiologic Detection and Characterization of Retained Foreign Bodies in Extremities

Ken F Linnau MD,MS (Presenter)

LEARNING OBJECTIVES

1) Identify the most common extremity foreign bodies encountered in Emergency Radiology. 2) Discern the most appropriate imaging modality (computed radiography, ultrasound, CT, and MRI) to visualize a suspected retained foreign body at high conspicuity. 3) Describe the imaging characteristics of various retained foreign materials across the various modalities (computed radiography, ultrasound, CT).

ABSTRACT

PURPOSE/AIM: To review the prevalence and describe the imaging characteristics of the most commonly encountered subcutaneously retained extremity foreign bodies in the emergency room setting on various imaging modalities (CR, US, CT, MR). **CONTENT**

ORGANIZATION

Overview of the most commonly retained subcutaneous foreign bodies and review of the current literature. Display the different categories of foreign bodies and their imaging characteristics. Foreign body categories will include plastic, wood, glass, gravel, fish bones, needles and tubing. Describe each foreign body appearance on computed radiography, ultrasound, CT and MRI and provide illustrative clinical examples.

Brain Aneurysms

Friday, 08:30 AM - 10:00 AM • N227

ER **NR**

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RC805 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC805A • Diagnostic Evaluation of Brain Aneurysms

Juan P Villablanca MD (Presenter)

LEARNING OBJECTIVES

The course will review the relative strengths and limitations of current imaging techniques for the detection and follow-up of patients with symptomatic and asymptomatic cerebral aneurysms. A practical strategy for image review and analysis will be provided that ensures complete lesion characterization and minimizes operator error. A rubric for the analysis of the pre- and post-operative aneurysm patients will also be presented with an emphasis on a practical clinical approach. A brief natural history and modality based literature review will also be provided.

ABSTRACT

RC805B • Intervention for Brain Aneurysms

Steven W Hetts MD (Presenter) *

LEARNING OBJECTIVES

1) Discuss the current endovascular interventional approaches to both ruptured and unruptured brain aneurysm treatment. 2) Critically evaluate recent clinical trial results regarding interventional brain aneurysm treatment. 3) Appreciate the limitations to endovascular brain aneurysm treatment using current technologies. 4) Understand that cerebral vasospasm is the leading cause of mortality and morbidity for hospitalized patients with aneurysmal subarachnoid hemorrhage, and appreciate current approaches to treating vasospasm.

ABSTRACT

RC805C • The Neurointerventional Suite of the Future

Charles M Strother MD (Presenter) *

LEARNING OBJECTIVES

1) To understand the basic concepts behind selection of patients for revascularization based on physiologic criteria. 2) To understand the capabilities of measuring brain perfusion using C-arm CT. 3) To appreciate the potential value of using a single modality environment for the diagnosis, triage and treatment of patients with an acute ischemic stroke.

Emergency Radiology Case-based Countdown (An Interactive Session)

Friday, 08:30 AM - 10:00 AM • E353C

ER **MK** **GI** **CH**

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RC808 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC808A • Thoracic Top 10 Countdown

Faisal Khosa FFRCSI, FRCPC (Presenter)

LEARNING OBJECTIVES

The audience will be shown cases with acute presentations in the ER, the format will be interactive utilizing audience response system. At the end of the session the participants will be able to efficiently deal with complex situations presenting as acute emergency in the ER with resultant improved patient care.

2.

ABSTRACT

The Top 10 countdown will comprise of interactive audience response system in which 10 unknown Thoracic emergencies will be presented. The salient features of the cases would be illustrated along with more complex imaging modalities and possible differential diagnoses where appropriate.

RC808B • Abdominal Top 10 Countdown

Joel A Gross MD, MS (Presenter)

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.

Disclosure Index

A

Abbara, S. - Consultant, Perceptive Informatics, Inc Author with royalties, Reed Elsevier Author with royalties, Amirsys, Inc
Abujudeh, H. H. - Research Grant, Bracco Group Consultant, RCG HealthCare Consulting
Antoch, G. - Speaker, Siemens AG Speaker, Bayer AG
Aslam, R. - Research support, Bayer AG
August, D. L. - Stockholder, General Electric Company

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Berman, J. - Consultant, McGowan Associates, Inc
Blake, M. A. - Editor with royalties, Springer Science+Business Media Deutschland GmbH
Brown, R. - Investor, RadExchange, LLC

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D

De Mey, J. - Research Grant, General Electric Company
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