

2013 RSNA (Filtered Schedule)

Sunday, December 01, 2013

10:30-12:00 PM • [VSPD11](#) • Room: S100AB • Pediatric Radiology Series: Pediatric Neuroimaging I
10:45-12:15 PM • [SPO111](#) • Room: E353C • Oncodiagnosis Panel: Pediatric Sarcoma (An Interactive Session)
12:30-01:00 PM • [CL-PDS-SUA](#) • Room: S101AB • Pediatric Radiology - Sunday Posters and Exhibits (12:30pm - 1:00pm)
01:00-01:30 PM • [CL-PDS-SUB](#) • Room: S101AB • Pediatric Radiology - Sunday Posters and Exhibits (1:00pm - 1:30pm)
02:00-03:30 PM • [VSPD12](#) • Room: S102AB • Pediatric Radiology Series: Pediatric Musculoskeletal

Monday, December 02, 2013

08:30-10:00 AM • [RC224](#) • Room: E353B • Mentored Case Approach to Pediatric Cardiovascular Disease 1: Vascular Disease (An Interactive Session)
08:30-12:00 PM • [VSPD21](#) • Room: S102AB • Pediatric Radiology Series: Fetal - Neonatal Imaging
12:15-12:45 PM • [CL-PDS-MOA](#) • Room: S101AB • Pediatric Radiology - Monday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • [CL-PDS-MOB](#) • Room: S101AB • Pediatric Radiology - Monday Posters and Exhibits (12:45pm - 1:15pm)
03:00-04:00 PM • [SSE21](#) • Room: S102AB • Pediatric (Neuroimaging)

Tuesday, December 03, 2013

08:30-10:00 AM • [RC324](#) • Room: S402AB • Mentored Case Approach to Pediatric Cardiovascular Disease 2: Cardiac Disease (An Interactive Session)
08:30-12:00 PM • [VSPD31](#) • Room: S102AB • Pediatric Radiology Series: Chest/Cardiovascular Imaging I
12:15-12:45 PM • [CL-PDS-TUA](#) • Room: S101AB • Pediatric Radiology - Tuesday Scientific Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • [CL-PDS-TUB](#) • Room: S101AB • Pediatric Radiology - Tuesday Posters and Exhibits (12:45 - 1:15PM)
01:30-03:00 PM • [MSSES33](#) • Room: S100AB • Essentials of Pediatric Imaging
03:00-06:00 PM • [VSPD32](#) • Room: S102AB • Pediatric Radiology Series: Advanced Pediatric Abdominal Imaging
04:30-06:00 PM • [RC405](#) • Room: E451B • Interactive Game: Pediatric CNS Disorders

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 • [RC513](#) • Room: S103AB • Child Abuse (An Interactive Session)
10:30-12:00 PM • [SSK18](#) • Room: S102AB • Pediatrics (Imaging)
12:15-12:45 PM • [CL-PDS-WEA](#) • Room: S101AB • Pediatric Radiology - Wednesday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • [CL-PDS-WEB](#) • Room: S101AB • Pediatric Radiology - Wednesday Posters and Exhibits (12:45pm - 1:15pm)
02:20-03:20 PM • [MSRT42](#) • Room: N230 • ASRT@RSNA 2013: Pediatric CT/CTA: Techniques and Applications
03:00-04:00 PM • [SSM18](#) • Room: S102AB • Pediatrics (Chest)

Thursday, December 05, 2013

08:30-10:00 AM • [MSCN51](#) • Room: S100AB • Case-based Review of Neuroradiology: Brain (An Interactive Session)
08:30-10:00 AM • [MSCP51](#) • Room: S406A • Case-based Review of Pediatric Radiology: Pediatric Thoracic Imaging (An Interactive Session)
08:30-10:00 AM • [RC613](#) • Room: S102AB • Vascular Lesions in Children: Diagnostic Dilemmas and Treatment Options
10:30-12:00 PM • [MSCN52](#) • Room: S100AB • Case-based Review of Neuroradiology: Spine (An Interactive Session)
10:30-12:00 PM • [MSCP52](#) • Room: S406A • Case-based Review of Pediatric Radiology: Pediatric MSK Imaging (An Interactive Session)
10:30-12:00 PM • [SSQ17](#) • Room: S102AB • Pediatrics (Neuroradiology)
10:30-12:00 PM • [SSQ18](#) • Room: S102C • Pediatrics (Radiation Dose Reduction)
12:15-12:45 PM • [CL-PDS-THA](#) • Room: S101AB • Pediatric Radiology - Thursday Posters and Exhibits (12:15pm - 12:45pm)
12:45-01:15 PM • [CL-PDS-THB](#) • Room: S101AB • Pediatric Radiology - Thursday Posters and Exhibits (12:45pm - 1:15pm)
01:30-03:00 PM • [MSCN53](#) • Room: S100AB • Case-based Review of Neuroradiology: Head and Neck (An Interactive Session)
01:30-03:00 PM • [MSCP53](#) • Room: S406A • Case-based Review of Pediatric Radiology: Pediatric Abdominal Imaging (An Interactive Session)
03:30-05:00 PM • [MSCP54](#) • Room: S406A • Case-based Review of Pediatric Radiology: Pediatric Pelvis Imaging (An Interactive Session)
03:40-04:40 PM • [MSRT56](#) • Room: N230 • ASRT@RSNA 2013: Improving Practice in Pediatric Skeletal Radiography
04:30-06:00 PM • [RC713](#) • Room: S102AB • Pediatric Neuroimaging II

Friday, December 06, 2013

08:30-10:00 AM • [RC813](#) • Room: N229 • Chest/Cardiovascular Imaging II
08:30-10:00 AM • [RC851](#) • Room: E261 • Pediatric Neurosonography Update: Head, Spine, and Transcranial Doppler Ultrasound (How-to Workshop)
10:30-12:00 PM • [SST13](#) • Room: N229 • Pediatrics (Interventional)

Pediatric Small Bowel Crohn Disease: Ultrasound-MR Enterography Correlation

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CL-PDE3021

Jonathan R Dillman, MD *
Ethan A Smith, MD
Ramon Sanchez, MD
Michael A Dipietro, MD
Peter J Strouse, MD
Kassa Darge, MD, PhD
Vera Dematos-Maillard, MD

PURPOSE/AIM

To illustrate bowel and mesentery ultrasound (US) findings in children with small bowel Crohn disease. US findings will be presented alongside temporally-related MR enterography (MRE) images.

CONTENT ORGANIZATION

1. We will identify pediatric small bowel Crohn disease patients that have undergone temporally-related bowel US and MRE examinations (within 0-14 days). 2. Bowel US technique will be presented. 3. Advantages/disadvantages of bowel US compared to MRE and CT will be reviewed. 4. Representative bowel US and correlative MRE images will be presented in a systematic, cased-based manner. The following will be illustrated: a. Bowel wall thickening, altered echogenicity, Doppler hyperemia, luminal narrowing/stricture, and dilatation (due to obstruction). b. Mesenteric abnormalities, such as fistulas/sinus tracts, fibrofatty proliferation, inflammation, and lymph node enlargement. c. Intra-abdominal fluid, including free fluid, phlegmon, and abscess.

SUMMARY

US excellently depicts bowel and mesenteric changes related to pediatric small bowel Crohn disease. This technique has numerous advantages, including low cost, lack of ionizing radiation, and no sedation requirement. Our exhibit demonstrates that bowel US is a viable imaging modality when assessing Crohn disease in children.

CL-PDE3022

John R Mernagh , MD
Yong Dong Wang , MD, PhD
Nina P Singh , MD

PURPOSE/AIM

Necrotizing enterocolitis (NEC) is a serious condition in the neonate, believed to result from a combination of bowel infection and ischemia. The diagnosis however remains problematic with most diagnoses relying on plain film examinations and the identification of bowel wall thickening and pneumatosis intestinalis. The use of ultrasound and Doppler ultrasound in the diagnosis of necrotizing enterocolitis is a newer technique which has the potential of providing a more reliable diagnosis and method of following treatment. This presentation will review the use of ultrasound in the diagnosis of necrotizing enterocolitis.

CONTENT ORGANIZATION

In this pictorial review we will present the spectrum of ultrasound appearances of neonatal NEC. Included in the presentation will be: 1. A review of the diagnosis and assessment of severity of NEC with ultrasound with comparison to plain film diagnosis. 2. A review of the use of Doppler ultrasound to assess bowel viability 3. A review of the best modalities for the assessment of NEC and specific protocols for the assessment of NEC

SUMMARY

Major teaching points: 1. Diagnosis and assessment of severity of NEC with ultrasound. 2. The use of Doppler ultrasound to assess bowel viability. 3. The best modalities for the assessment of NEC and specific protocols for the assessment of NEC.

Fibroepithelial Polyps of the Urinary Tract in Children**CL-PDE3024**

Mikhail Higgins , MD
Kassa Darge , MD, PhD
Tiffany Hwang *

PURPOSE/AIM

We present an educational pictorial essay outlining diagnostic considerations essential to increase the awareness of this understated entity in children and also aid the radiologist in timely and accurate preoperative characterization of this elusive diagnosis, allowing for appropriate directed management.

CONTENT ORGANIZATION

This exhibit will be structured to accomplish the following:

- Summarize the pediatric epidemiologic data regarding fibroepithelial polyps of the urinary tract in children.
- Present an overview of the radiographic features of fibroepithelial polyps in the core diagnostic modalities, namely ultrasound, excretory urography, retrograde pyeloureterography and MR urography.
- Discuss the critical problem of pelviureteric junction obstruction due to fibroepithelial polyps.

SUMMARY

Fibroepithelial polyps are rare benign primary ureteral neoplasms. Their presence in children presenting with flank pain, hematuria, urinary tract infection and obstruction is often overlooked, resulting in missed diagnoses and improper clinical management, including ureteronephrectomy. Given the role of ureteroscopic laser ablation as a curative technique, we present the critical diagnostic considerations necessary to achieve early radiologic diagnosis, determine the need for histological sampling and ultimately guide definitive less invasive management.

Imaging Inflammatory Bowel Disease in Young Patients: Which Modality to Choose and How Do Imaging Findings Impact Patient Management?**CL-PDE3025**

Arash Anvari , MD
Sudha A Anupindi , MD
Michael S Gee , MD, PhD

PURPOSE/AIM

Review the role of imaging in the management of inflammatory bowel disease (IBD), discuss pros and cons of different modalities, and define an algorithm for imaging these young patients.

CONTENT ORGANIZATION

1. Epidemiology and pathophysiology
2. Role of imaging in management of patients at diagnosis, during treatment, and recurrence
 - a. Disease distribution
 - b. Extraintestinal manifestations
 - c. Disease activity
 - d. Extraluminal complications
3. Current IBD treatment
 - a. Goals of treatment
 - b. Traditional and molecule-targeted anti-inflammatory medications
 - c. Medical and surgical options for perianal disease
4. Imaging modalities: diagnostic performance, advantages and limitations
 - a. Fluoroscopic small bowel series and enteroclysis
 - b. CT
 - c. CT enterography
 - d. CT/MR enteroclysis
 - e. Pelvic MRI for perianal disease
 - f. MR enterography
 - g. Ultrasound (US)
5. Potential risks from ionizing radiation
6. Potential long-term risks from IBD and treatment
7. Radiation reduction strategies:
 - a. CT dose reduction methods/sub-mSv scanning
 - b. Utilization of US and MRE
8. Imaging algorithm:
 - a. Undiagnosed/suspected IBD
 - b. Newly diagnosed IBD
 - c. Established IBD

SUMMARY

We review the role of imaging in clinical management of patients with IBD patients and define an imaging algorithm for young patients with suspected or established IBD.

CL-PDE3027

Koen F De Geus
Charlotte M Nusman, MSc
Mario Maas, MD, PhD

PURPOSE/AIM

The purpose of this exhibit is: - To provide radiologists with a practical and easy-to-use visualized roadmap on assessing the difficult anatomy of the SI-joint of children on MRI. - To structurally review anatomic findings and growth patterns of the SI-joint. - To present pathologic findings in JIA in a comprehensible and interactive way.

CONTENT ORGANIZATION

- How to image? -- What sequences and orientations are preferable in imaging the various parts of the SI-joint? - What to look for? -- What are normal findings and primary locations of pathological processes? - What to expect? -- What are the features of the healthy growing SI-joint on MRI and what are pitfalls you should be wary of?

SUMMARY

The major teaching point of this exhibit is to make the assessing and imaging of the SI-joint regarding JIA comprehensible and easy for all radiologists. By visiting this exhibit, the viewer will accomplish to - Understand the normal anatomy and growth of the SI-joint with its consequences for MRI - Easily recognize the various pathologic findings associated with JIA while considering major pitfalls - Efficiently image and assess the SI-joint by using an easy roadmap consisting of unique visuals

Pediatric Percutaneous Pulmonary Interventional Procedures Using Cone Beam CT with Live and Integrated Needle Guidance[Back to Top](#)**CL-PDE3028**

Subramanian Subramanian, MD
David C Moe, MD
Nghia Vo, MD

PURPOSE/AIM

The aim of the exhibit is to illustrate the use of cone beam CT with live and integrated needle guidance in pediatric percutaneous pulmonary interventional procedures. These procedures include preoperative localization, lesion biopsy, and thermal ablation of pulmonary lesions in children.

CONTENT ORGANIZATION

A. Overview of cone beam CT. B. Overview of live and integrated needle guidance using cone beam CT acquisition. C. Case based examples of percutaneous procedures involving the pediatric lung using cone beam CT with live and integrated needle guidance.

SUMMARY

Pediatric percutaneous pulmonary interventional procedures using cone beam CT with live and integrated needle guidance offers numerous advantages over conventional CT guidance including: a. Improved direct access to the patient for the interventional radiologist and anesthesiologist. b. Real time fluoroscopic needle guidance to target lesion via superimposed graphics. c. Ability to utilize a greater range of needle trajectories (overcomes limitations of CT gantry angle). d. Improved and real time ability to respond to potential complications (recognition and treatment of pneumothorax).

Normal Doppler Spectral Waveforms of Neonatal Cerebral Veins: Clinical Utility[Back to Top](#)**CL-PDE3029**

Ricardo Becerra Ulloa, MD
George A Taylor, MD
Luis Felipe Alva Lopez, MD
Rocio C Brom-Valladares, MD
Roberto G Hidalgo
Digna Pachuca Gonzalez, MD

PURPOSE/AIM

-To review the normal Doppler US anatomy of the neonatal cerebral venous system (NCVS) -To review the normal spectral waveform pattern in NCVS -To define normal US Doppler spectral variables in NCVS -To propose the clinical utility and application of US Doppler spectral analysis of NCVS

CONTENT ORGANIZATION

-General overview characteristics of the US Doppler spectrum in NCVS and the information that can be derived from it -Normal sonographic anatomy of NCVS and technical approach for spectral Doppler analysis -Impact of anatomical and physiological variables in NCVS flow characteristics -We summarize our experience initiated in September 2012 during the visit of international RSNA professor program and compare it with available literature: normal and pathologic examples

SUMMARY

-US Doppler of NCVS relates directly both to cerebral and systemic conditions of the newborn -Knowledge of US Doppler, normal and pathologic characteristics, aids in evaluation and follow up of neonates

Radiological Examination of the Neonatal Head and Spine: Ultrasound versus MRI[Back to Top](#)**CL-PDE3031**

John R Mernagh, MD
Yong Dong Wang, MD, PhD
Nina P Singh, MD

PURPOSE/AIM

In the assessment of the neonatal head and spine US and MRI are the examinations of choice in most institutions. At our institution we routinely use US as the first examination of choice. With the development of modern high resolution US equipment pathology which could once only be seen with MRI can now be routinely seen with US. In many instances US alone is able to give the correct diagnosis without the necessity of MRI.

The advantages of US over MRI are that the examination can be performed at the bedside in a neonatal intensive care unit without the need for anesthesia, without taking the neonate out of its incubator, and the ease with which the examination can be performed as often as clinically required.

This presentation will review the use of US and MRI in the assessment of the neonatal head and spine.

CONTENT ORGANIZATION

In this pictorial review we will present: 1. A review of abnormalities of the neonatal head and spine that can be assessed with US alone. 2. A review of the limitations of US. 3. A review of abnormalities of the neonatal head and spine that require MRI for assessment.

SUMMARY

Major teaching points: 1. Many abnormalities of the neonatal head and spine can be assessed with US alone. 2. Limitations of US. 3. Abnormalities of the neonatal head and spine that require MRI for assessment.

CL-PDE4015**Ahmed Abdel Razek , MD****PURPOSE/AIM**

- 1-To review basic background about pediatric CNS inflammatory demyelinating disorders (CIDD)
- 2- To illustrate classification of pediatric CIDD
- 3-To discuss typical and atypical imaging appearance of pediatric CIDD
- 4-Role of advanced imaging in diagnosis of pediatric CIDD

CONTENT ORGANIZATION

- 1-Consensus definitions proposed for pediatric multiple sclerosis and related disorders
- 2-Update classification of pediatric CIDD
- 3-Prevalence and incidence, world distribution, current diagnosis criteria, treatment strategies
- 4-Imaging appearance of pediatric multiple sclerosis
- 5-Imaging of acute disseminated encephalomyelitis and its variants as recurrent and multiphasic
- 6-Imaging of pediatric neuromyelitis optica
- 7-Imaging of pediatric clinically isolated syndrome
- 8-Imaging of Schilder's disease
- 9-Role of advanced MR imaging in pediatric CIDD
- 10-Imaging findings used to differentiate pediatric CIDD from other simulating lesions
- 11-Summary and future directions

SUMMARY

The major teaching points of this exhibit are:

- 1- To be familiar of the radiologist with clinical criteria, typical and atypical imaging appearance of pediatric CIDD
- 2-To highlighted imaging findings with routine and advanced imaging used to differentiating pediatric MS from simulating lesions

High-field 3T MRI Perfusion Using Arterial Spin Labeling (ASL): A Pictorial Review of Pediatric Central Nervous System Applications**CL-PDE4016**

Juan P Salazar , MD, MSc
Angel Sanchez-Montanez
Ignacio Delgado , MD
Adriana C Montealegre Angarita
Montserrat Fernandez
Elida Vazquez , MD

PURPOSE/AIM

To review arterial spin labeling (ASL) methodologies and clinical applications, while focusing on pediatric neuroscience.

CONTENT ORGANIZATION

ASL provides an endogenous and completely noninvasive tracer for the quantification of regional cerebral blood flow (CBF) with magnetic resonance imaging (MRI). ASL also plays a role as a biomarker of regional brain function in basic and clinical neuroscience. We should be aware of nephrotoxicity of magnetic resonance contrast media, and about renal immaturity in infants under one year of life. Radiologists must try to administrate gadolinium just when it is necessary and when additional information will be acquired. We review some examples of ASL applications in different clinical neuropediatrics scenarios: stroke, hypoperfusion syndromes, PRES, infection, epilepsy, migraine, encephalopathy, oromotor disorders, neurooncology.

SUMMARY

ASL should be acquired as part of a multimodal MRI examination in our daily clinical practice because it may help us in the diagnosis of some pathologies and in the approach to a huge differential diagnosis. Its characteristics as a noninvasive, easy and fast method, make ASL a very important utility in pediatric MR imaging.

Systemic Venous Anomalies of the Chest and Abdomen- Embryology, Imaging Appearances, Clinical Implications and Management**CL-PDE4017**

Ravi Ashwath , MD
Guruprasad Mahadevaiah
Rakesh Sinha , MD
Prabhakar Rajiah , MD, FRCR

PURPOSE/AIM

1. To discuss the embryology of systemic veins of the chest and abdomen.
2. To characterize the CT/MR appearances of these anomalies.
3. To review their clinical and surgical implications

CONTENT ORGANIZATION

1. Embryological review of the development of the systemic venous system of the chest and abdomen.
2. CT and MRI protocols for the evaluation of these anomalies
3. The following systemic venous anomalies are discussed, particularly with regards to embryology, imaging appearances, clinical implications and management.
 - Left superior vena cava (SVC)
 - Bilateral SVC with normal drainage
 - Bilateral SVC with unroofed coronary sinus
 - Absent right SVC in visceroaortic situs solitus
 - Bilateral absence of SVC
 - Left atrial/biatrial drainage of right SVC
 - Levoatrialcardinal vein
 - Heterotoxy syndromes- Interrupted IVC with bilateral SVCs or a single left SVC;
 - Retroaortic left innominate vein
 - Double IVC
 - Interrupted IVC, Azygos continuation of IVC
 - IVC drainage to LA
 - Circumaortic/retroaortic left renal vein
 - Absent infrarenal IVC
 - Circumcaval ureter

SUMMARY

CT and MRI play an important role in the evaluation of various systemic venous anomalies. A thorough understanding of the venous

Spectrum of Common Artifacts on Images Obtained Using the EOS System: Pitfalls for the Radiologist to Avoid

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CL-PDE4018

Steven L Blumer, MD
David Dinan, MD
Leslie E Grissom, MD

PURPOSE/AIM

To become acquainted with the common artifacts seen on images obtained using the EOS system, a new biplanar, low-dose orthopaedic imaging system often used in children. We aim to demonstrate these artifacts as well as their causes and methods to rectify them for all radiologists and especially those who are not familiar with this system.

CONTENT ORGANIZATION

A. Background Information on EOS B. Specific Artifacts 1. Movement Artifacts a. Causes b. Specific movement artifacts 1. Wavy fusion rods 2. Bowing of long bones 3. Banding artifact 4. Pseudopneumomediastinum artifact 5. Irregular/undulating heart border c. Solutions 3. Edge enhancement artifacts a. Causes b. Specific types 1. Halo artifact c. Solutions 4. Incorrect Centering artifacts a. Causes b. Specific types 1. Smaller/Wider and Taller/Thinner c. Solutions C. Conclusion

SUMMARY

EOS is a new biplane imaging system that is particularly useful for imaging children with skeletal disorders such as scoliosis and skeletal dysplasias with a lower dose than more conventional techniques. We have presented the common artifacts which we have observed on images obtained with the EOS system as well as their causes and potential solutions for all radiologists, especially those who are unfamiliar with the EOS system.

Pediatric Gastrointestinal Volvulus: Twisting beyond Malrotation

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CL-PDE4019

Wendi A Owen, MD
Geetika Khanna, MD,MS

PURPOSE/AIM

Malrotation and midgut volvulus are well recognized entities in the pediatric population. Though less common, volvulus of the stomach and colon also occur in the pediatric population and have characteristic imaging findings. Delay in diagnosis of gastrointestinal volvulus can lead to significant morbidity and mortality. The aim of this presentation is to review the risk factors and imaging findings of gastric, colonic, and non-malrotation related small bowel volvulus in children.

CONTENT ORGANIZATION

This poster will present cases of gastric, cecal, sigmoid, and midgut volvulus not associated with malrotation. Risk factors for development of these entities will be discussed. The common imaging findings on plain film, CT, and fluoroscopy will be reviewed. We will describe the common subtypes of volvulus of the stomach and colon. Additionally, management of the various types of volvulus will be addressed.

SUMMARY

Increased awareness of common presentations, known causes, and imaging findings associated with non-malrotation related gastrointestinal volvulus in children is critical for prompt diagnosis and prevention of life-threatening complications. This presentation highlights the clinical features and imaging findings of non-malrotation related volvulus in the pediatric gastrointestinal tract.

Tetralogy of Fallot. Imaging from Fetus to Adult

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CL-PDE4020

Carlos Marin, MD
Alejandro Rodriguez, MD
Angel Lancharro, MD
Yolanda Ruiz, MD
Alejandra Aguado, MD
Enrique Maroto

PURPOSE/AIM

The purpose of this exhibit is:

1. To review the anatomy and pathophysiology of Tetralogy of Fallot (TOF)
2. To describe the treatment options for TOF
3. To discuss the morphologic and functional data with different imaging techniques along the course of the disease.

CONTENT ORGANIZATION

Embryologic and anatomic considerations in TOF.

Pathophysiology of TOF.

Imaging findings in TOF

- Prenatal imaging.

- Neonate and infant with TOF. Presurgical imaging.

- Postsurgical follow-up. Short and long term complications and relevant functional data

SUMMARY

Tetralogy of Fallot (TOF) is the most common cyanotic congenital heart disease. To accomplish a successful examination, radiologists must understand the anatomy and pathophysiology of TOF, as well as the different surgical approaches and their complications.

Accurate prenatal diagnosis can be achieved by means of prenatal ultrasound. In neonates and infants, cardiac sonography generally suffices for preoperative planning.

Repeated imaging tests are commonly performed in the postoperative follow up of these patients. Safe techniques that offer comprehensive morphologic and functional data are required. With its excellent spatial resolution, high accuracy for functional evaluation, and lack of ionizing radiation, Cardiac MR reaches these purposes and is generally the first choice examination.

MRI Interpretation of Pediatric Liver Masses

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CL-PDE4021

Joseph V Loeb, BS, ARRT
Michael D Collard, MA
Christopher P Keup, MD
Lisa H Lowe, MD
Joshua Q Knowlton, MD, MPH

PURPOSE/AIM

Pediatric liver lesions may be characterized by MR signal and contrast enhancement patterns. Use of hepatocyte specific agents(HSA) in addition to traditional extracellular agents (EA), can help limit the differential diagnosis when imaging pediatric liver lesions. The purpose of this exhibit is to:

1. Review the MR signal and contrast enhancement patterns of common pediatric liver neoplasms.
2. Allow learners to apply knowledge gained of HSA's to diagnose a variety of pediatric liver lesions.

CONTENT ORGANIZATION

A table outlining the key US, CT, and MR findings of common pediatric liver lesions is initially presented. Enhancement patterns with HSA and EA are discussed. A case based presentation in quiz format follows, each with a brief discussion of the lesion including key clinical and imaging findings useful to distinguish the particular lesion. The exhibit includes:

- Six benign liver lesions, such as infantile hemangioma and mesenchymal hamartoma.
- Seven malignant liver lesions, such as hepatoblastoma and embryonal rhabdomyosarcoma.

SUMMARY

Characterization of pediatric liver lesions has been improved due to growing awareness of EA and HSA enhancement patterns. This case based exhibit discusses 13 pediatric liver lesions including key MR signal and contrast enhancement patterns useful to making a diagnosis.

The Children of War: Overview of the Radiological Manifestations of Pediatric Pathology in Afghanistan and Iraq Based on Experience of U.S. Air Force Radiologists

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CL-PDE4022

Brian F McQuillan , MD
David M Biko , MD
Paul M Sherman , MD
John P Lichtenberger , MD
Bryson D Borg , MD
Robert A Jesinger , MD

PURPOSE/AIM

To explore the radiologic manifestations of pediatric pathology encountered by US Air Force radiologists during deployment in Afghanistan and Iraq.

CONTENT ORGANIZATION

US Armed Forces radiologists deployed to Afghanistan and Iraq in modern military conflicts may encounter pediatric patients as a casualty of war or when providing humanitarian assistance to the indigenous population. The spectrum of pediatric trauma, endemic infections, and developmental disorders in this experience is often atypical and/or advanced. Key topics include:

- Trauma: Atypical patterns of injury
- Infection: Endemic disease to Afghanistan and Iraq not frequently encountered in the US
- Developmental disorders: Often delayed and dramatic presentations of lethal and non-lethal disease

SUMMARY

This exhibit evaluates the imaging findings of pediatric pathology typically encountered by a deployed radiologist, who should be familiar with imaging pediatric trauma patients, the pathology endemic to the local population, and delayed presentations of developmental disorders. Moreover, the US radiologist may benefit from exposure to the atypical and/or advanced disease encountered in the austere environments of Afghanistan and Iraq.

Pediatric Dose Reduction Technologies: What's Available on the Latest CT Scanners

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CL-PDE4023

Saurabh Agarwal , MD
Marilyn J Siegel , MD *
Juan Carlos Ramirez Giraldo , PhD
David Bradley *

PURPOSE/AIM

Describe terminologies and technical parameters related to CT doses and dose reduction technologies. Illustrate latest dose reduction techniques and applications.

CONTENT ORGANIZATION

1. Basic dose reduction tools on the current generation of CT scanners- automated tube current modulation, automated tube potential selection, and iterative reconstruction.
2. Description of technical details of the principles underlying each of these three dose reduction utilities.
3. Dose reduction expected from each technology alone.
4. Maximum radiation dose savings expected in combination.

SUMMARY

Advancements in radiation dose reduction tools in the latest generation of CT scanners have enabled substantial decreases in dose, up to two third the dose of older generation scanners. Feasibility and dose reduction of these technologies can be shown in pediatric chest and abdominal CT and CT angiography. In this educational exhibit, we will review details of the principles underlying each of the major dose reduction tools and impact on dose and will present findings of clinical cases.

The Belly Button and Its Connections with the Gut and Bladder: A Review of Vitelline and Urachal Remnants

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CL-PDE4024

Swapnil S Bagade , MD
Geetika Khanna , MD,MS
Kathryn Bernabe , MD

PURPOSE/AIM

Review embryology of umbilical cord. Discuss imaging workup of a child with a draining umbilicus. Review clinical manifestations of vitelline duct remnants, including the common (Meckel's diverticulum) and not so common (vitelline duct fistula) with surgical correlation. Radiologic-surgical correlation of urachal remnants.

CONTENT ORGANIZATION

1. Embryology of the umbilicus.
2. Normal anatomy of the five structures present in the normal umbilical cord.
3. Discuss the protean manifestations of remnants of the vitelline duct with intra-operative correlation.
4. Discuss the clinical manifestations and management of urachal remnants.
5. Appropriate imaging evaluation based on clinical presentation will be emphasized.
6. The archives of our surgical-radiological conference will be used to illustrate the above pathology.

SUMMARY

1. Vitelline duct (VD) pathology can present in the newborn as a discharging umbilicus and in the older child as GI bleeding or obstruction.
2. VD pathology should be suspected as likely etiology for obstruction in a child with no identified etiology and no risk factors for adhesions.
3. Fluoroscopy and sonography are imaging modalities of choice for evaluation of a draining umbilicus.
4. Sonographic and CT findings of VD anomalies can mimic appendicitis and enteric duplication cysts.

Normal Variants or Pathology?: All We Need to Know about the Pediatric Knee

CL-PDE4025

Kevin K Lee , MD
Benjamin B Chou , MD
Bo Yoon Ha , MD

PURPOSE/AIM

This exhibit aims to:

1. Review relevant anatomy and embryology of normal variants at the knee in pediatric patients.
2. Describe characteristics imaging features of the diverse spectrum of normal variants.
3. Incorporate discussion of imaging's role in clinical management.

CONTENT ORGANIZATION

• Cases include, but are not limited to flame-shaped marrow, stippled marrow, focal cortical defect, asymmetric development of the distal femoral epiphysis, distal femoral metaphyseal irregularity, physiologic bowing, transverse growth lines, dorsal patella defect, multipartite patella, discoid meniscus, intermeniscal ligaments, and menisiofemoral ligaments. • Cases are presented in a quiz format followed by: 1. Characteristic imaging findings on plain film, CT, and MR 2. Relevant anatomy and embryology of each normal variant 3. Comparison with potential mimics which represent true pathology.

SUMMARY

Pediatric knee normal variants can resemble pathologic processes, but can be distinguished if the radiologist is familiar with anatomic details of normal variants and their distinguishing imaging features. After viewing this exhibit, radiologists will become familiar with normal variants in the pediatric knee and increase their accuracy of diagnosis when encountering such cases.

Detection of Calcifications in Retinoblastoma Using Gradient-echo MR Imaging Sequences: Comparative Study between In-vivo MR Imaging and Ex-vivo High Resolution CT

[Back to Top](#)**CL-PDE4026**

Paolo Galluzzi , MD
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PURPOSE/AIM

Intratumoral calcifications are important in the diagnosis of retinoblastoma. Although CT is superior in detecting calcification, radiation hazard should be avoided. The purpose of our study is to validate the value of T2*WI for detection of calcifications in retinoblastoma with ex- vivo CT as golden standard.

CONTENT ORGANIZATION

Twenty-two consecutive patients with retinoblastoma (mean age, 21 months, range 1 - 71 months) with enucleation as primary treatment were scanned at 1.5-T using a dedicated surface coil. Signal intensity void (SIV) indicating calcification on T2*WI were compared with ex-vivo high resolution CT (HRCT) Other parameters included shape and location of SIVs. In 5 tumors susceptibility weighted images (SWI) were evaluated.

93% (25/27) of the SIVs inside the tumor correlated with calcifications compared to none (0/6) of the SIVs outside the tumor. Areas of nodular shaped SIVs correlated to calcifications in 92% (24/26) and linear shaped SIVs correlated to hemorrhage in 67% (6/9). The correlation between SIVs on SWI was better in 4 out of 5 tumors compared to T2*WI.

SUMMARY

SIVs on in-vivo T2*WI correlates well with calcifications on ex-vivo HRCT in retinoblastoma. The combination of fundoscopy, ultrasound and high-resolution MR imaging with gradient-echo sequences could become the standard diagnostic approach to diagnose retinoblastoma.

Prenatal Diagnosis of Fetal Skeletal Dysplasia with 3D Computed Tomography

[Back to Top](#)**CL-PDE4027**

Osamu Miyazaki , MD
Gen Nishimura
Tetsuya Horiuchi
Haruhiko Sago

PURPOSE/AIM

To evaluate the efficacy of Fetal 3D CT using three protocols with different radiation doses and through comparing findings between fetal CT and conventional postnatal radiographic skeletal survey.

CONTENT ORGANIZATION

1. Diagnostic image; Fetal CT provided the correct diagnosis in all 17 fetuses, including osteogenesis imperfecta, Pfeiffer syndrome type 2, chondrodysplasia punctata MT type, hypochondrogenesis, short rib polydactyly type III and others.
2. Accuracy; The detectability rate of cardinal findings was 93.5% .
3. Clinical usefulness; The 59% of fetuses an US-based diagnosis was changed prenatally due to CT findings
4. Radiation dose; The estimated fetal radiation dose was 3.4mSv

SUMMARY

Prenatal diagnosis of fetal skeletal dysplasias with 3D computed tomography is useful. This exhibit reviews

- Capability of fetal CT; almost the same as that of postnatal skeletal survey
- Clinical images of typical fetal skeletal dysplasias
- The perinatal management; Specific CT findings aided in counseling and in the management of pregnancy

A Pictorial Review of the MRI Appearances of Pediatric Muscle Pathology

[Back to Top](#)**CL-PDE4028**

Jeremy B Jones , MRCP, FRCR
Murray J Bartlett , MBBS

PURPOSE/AIM

1. To review the general appearances of pediatric muscle pathology at MRI.
2. To illustrate the specific appearances of pediatric muscle pathology.

CONTENT ORGANIZATION

The MRI appearances of muscle pathology in pediatric patients can be broadly split into 3 groups: muscle edema; muscle atrophy (increased fat) and muscle masses. We present examples of the main causes of muscle pathology in all three categories. **Muscle edema**

may be secondary to traumatic, infective or inflammatory pathology:

- trauma: resulting in muscular strain or tear
- infective myositis: secondary to hematogenous spread (pyomyositis) or local spread from adjacent infective processes, e.g. cellulitis, discitis
- inflammatory myopathies, e.g. polymyositis and dermatomyositis

Muscle atrophy results in fatty change within the muscle:

- disuse
- chronic debilitating processes such as muscular dystrophy
- denervation may also cause muscle atrophy although in the subacute phase it results in edema

Muscle masses have a wide differential that includes:

- soft tissue sarcoma
- hemangioma
- hematoma
- abscess, in severe cases of infection

SUMMARY

Pediatric muscle pathology represents a heterogeneous group of disorders that have distinctive appearances at MRI.

Assessment of Size-specific Dose Estimates during Pediatric Abdominal CT in the Largest Children's Hospital in Japan

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CL-PDE4029

Rumi Imai
Osamu Miyazaki, MD
Tetsuya Horiuchi

PURPOSE/AIM

CONTENT ORGANIZATION

SUMMARY

The results of CTDIvol -/ -SSDE (mGy) were as follows:

- Pink 6.0-7.4kg: 2.88-/-3.25, Red 7.5-9.4kg: 3.1-/-3.35, Purple 9.5-11.4kg: 3.56-/-3.79, Yellow 11.5-14.4kg: 1.75-/-3.67, White 14.5-18.4kg: 1.94-/-3.98, Blue 18.5-22.4kg: 2.38-/-4.65, Orange 22.5-31.4kg: 2.88-/-5.42, Green 31.5-40.4kg: 6.15-/-10.79, Black 40.5-kg: 8.93-/-14.5.

- In all color-coded weight ranges, the SSDE indicated higher values than did CTDI vol.

- The SSDE is useful for the evaluation of the pediatric patient dose when assessing risks.

Imaging Features of Tumefactive Multiple Sclerosis in Pediatric Patients

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CL-PDE4030

Chetan C Shah, MBBS

PURPOSE/AIM

Although uncommon in pediatric patients, tumefactive multiple sclerosis do occur and may be mistaken for a neoplasm leading to unnecessary brain biopsy. Purpose of this exhibit is to increase awareness of imaging features of tumefactive multiple sclerosis in pediatric population.

CONTENT ORGANIZATION

The exhibit will be a PowerPoint presentation. Initial slides will provide introduction to multiple sclerosis and various variants of multiple sclerosis. This will be followed by brief discussion of diagnostic criteria for multiple sclerosis. Subsequently, imaging features of tumefactive multiple sclerosis will be discussed and illustrated by MRI images as well as MR spectroscopy images. Tractography before the treatment and after the treatment response will be presented. Differentiating features from a neoplasm will be discussed. Summary slide will provide salient features of the exhibit.

SUMMARY

Tumefactive multiple sclerosis can mimick a neoplasm. Correct diagnosis of tumefactive multiple sclerosis help avoid an invasive brain biopsy.

Comprehensive MR Enterography of Crohn's Disease in the Pediatric Population: From Technique to Interpretation

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CL-PDE4031

James Hlubocky, MD
Kiran R Nandalur, MD
Hai M Tien, MD
Monzer A Chehab, MD

PURPOSE/AIM

Magnetic Resonance enterography (MRE) has emerged as a robust method to evaluate the small intestines and other organs in Crohn's disease, given its excellent soft tissue contrast resolution and multiphase post contrast imaging. The lack of ionizing radiation makes it particularly appealing for utilization in the pediatric population. The purpose of our exhibit is to review MRE in children with Crohn's with emphasis placed on case-review. 1. To review the indications and literature on MRE in children with Crohn's disease. 2. To describe our MR protocol/sequences and rationale behind use. 3. To illustrate examples of small intestinal and non-intestinal pathology on MRE and emphasize keywords for cogent dictations

CONTENT ORGANIZATION

Relevant information from 50 pediatric MRE performed at our institution for Crohn's disease over the last year will be presented: -MR oral and IV contrast agents, along with sequences such as T1W, T2W, and diffusion. -Common and uncommon findings on MRE, including pitfalls

SUMMARY

MR enterography is a safe and effective method of evaluating small bowel pathology in children, specifically Crohn's disease, given its prevalence in the pediatric population. Properly performed, the technique is sensitive and specific for intestinal and extraintestinal disease, which can lead to improved patient outcomes.

Postmortem Fetal MR Imaging Atlas

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CL-PDE4032

Diego Gutierrez, MD
Carmen Sebastia Cerqueda, MD
Anna Darnell, MD
Rosario J Perea, MD

Alfons Nadal
Nuria Bargallo , PhD
Laura Oleaga

PURPOSE/AIM

To review the magnetic resonance imaging (MRI) protocol in the evaluation of post-mortem fetuses. To describe brain, head, neck and body MR normal findings in post-mortem fetuses. To correlate MR images with autopsy pathology findings.

CONTENT ORGANIZATION

From February 2012 we have been performing MR for the evaluation of post-mortem fetuses using 1.5T and 3T MR scanners. In most of the fetuses autopsy is also performed. In this educational exhibit we review the MR advantages and imaging protocol in the evaluation of post-mortem fetuses. We also describe normal fetus appearance and changes related to the post-mortem status. Normal imaging findings in the brain, head and neck, thoracic, abdominal and pelvic organs with pathological correlation are presented.

SUMMARY

Postmortem fetal MR imaging has become an increasingly important part in the examination of deceased fetuses and neonates, as part of a minimally invasive autopsy, especially when the family refuses a conventional autopsy. There are few publications focussing on normal organ findings, especially of body organs, in post-mortem fetal MR imaging. Knowledge of MR protocol and normal post-mortem fetal MR appearance is compulsory to carry out this new study in our daily routine work.

Signal Abnormalities of the Splenium in Children: A Neuroimaging Pattern-recognition Approach

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CL-PDE4033

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Thangamadhan Bosemani , MD, FRCR
Thierry Huisman , MD
Andrea Poretti

PURPOSE/AIM

Signal abnormalities of the callosal splenium are common, non-specific findings in pediatric neuroimaging and are seen in a wide spectrum of diseases. A neuroimaging pattern-recognition approach allows to cluster patients with identical MR patterns and, subsequently, to perform targeted laboratory and genetic tests to make the correct diagnosis. Here we propose a neuroimaging pattern-recognition approach of signal abnormalities of the splenium in children.

CONTENT ORGANIZATION

The literature was reviewed for etiologies of splenial signal abnormalities. A pattern-recognition approach is suggested considering isolated (pure) or associated (with e.g. basal ganglia or white matter involvement) and focal or diffuse splenial abnormalities. Neuroimaging examples of the various etiologies will be presented.

SUMMARY

Neuroimaging plays a key role as a diagnostic tool in acute and chronic diseases in pediatric neurology. A neuroimaging based pattern-recognition approach has proven to be very helpful in guiding the diagnosis of several neurological disorders in children. This pattern-recognition approach of splenial signal abnormalities in children is thought to be helpful in the differential diagnostic evaluation in order to plan the appropriate investigations and interpret their results.

Shedding Light on Pediatric Inflammatory Pseudotumor and Other Related Fibroblastic/Myofibroblastic Tumors

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CL-PDE4034

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Patricia A Kirby
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PURPOSE/AIM

To review radiologic-pathologic manifestations of inflammatory pseudotumor (IP) in the pediatric population. IP is a rare, generally benign process affecting children and young adults, which is often mistaken as malignancy. The etiology of IP is unknown, but various causes have been implicated, including trauma, infection, immune-mediated, and low grade-neoplasm. These processes result in a single lesion or multiple masses composed of polymorphous inflammatory cells (T- and B-lymphocytes, plasma cells and myofibroblastic cell) and collagen with fibrous reaction. Inflammatory myofibroblastic tumors (IMT) have been categorized under IP, but are now considered low grade neoplasms. Some IPs have been found to be associated with IgG4-related sclerosing disease.

CONTENT ORGANIZATION

We present imaging findings of IP affecting the pediatric population involving the orbits, skull base, paranasal sinus, CNS, musculoskeletal system, lungs, airway, gastrointestinal and genitourinary system with clinical and pathological correlation. We will cover entities including inflammatory pseudotumor, myofibroma, myofibromatosis, and IgG4-related sclerosing disease.

SUMMARY

Familiarity and knowledge of the imaging features of inflammatory pseudotumor can help in accurate diagnosis, thereby avoiding unnecessary radical surgery, as steroids alone can sometimes treat IP.

Cerebral Arteriopathies in Pediatric Stroke

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CL-PDE4035

Priya Sundaram , DO
Neil Friedman , MBChB
Unni K Udayasankar , MD, FRCR

PURPOSE/AIM

The risk factors for childhood stroke significantly differ from those of adult stroke. Vasculopathies and vascular malformations have been recognized as a major risk factor in development of pediatric stroke, often with poor short term outcome. This exhibit will illustrate the spectrum of arteriopathies in children underscoring the need for appropriate vascular imaging in detection and prevention of pediatric stroke.

CONTENT ORGANIZATION

Following types of arteriopathies will be illustrated with emphasis on specific clinical and imaging features

1. Vasculitis: Primary and secondary
2. Vasospasms
3. Dissection
4. Focal/Transient Cerebral Arteriopathies
5. Monogenic disorders

6. Moyamoya disease (Primary)
7. Moyamoya syndrome (Secondary)
8. Fibromuscular dysplasia
9. PHACES syndrome

Describe the role different imaging techniques in identification of disease with special emphasis on early detection of vessel wall inflammation Provide imaging flow chart for evaluation of children with new onset stroke

SUMMARY

Arteriopathies play a leading role in pediatric stroke and imaging is crucial in detection of specific vasculopathic conditions. This exhibit will familiarize the reader with various clinical presentations, imaging techniques and specific imaging features of various arteriopathies that result in pediatric stroke.

Imaging of Congenital and Acquired Vascular Malformations of the Pediatric Abdomen

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CL-PDE4036

Roy G Jacob , MD
Jeanne M Joglar , MD
Neil J Fernandes , MD
Nancy K Rollins , MD

PURPOSE/AIM

Vascular malformations in the abdomen can be congenital or acquired. The hepatic venous system develops at 5 weeks of gestation and its abnormalities affect the portosystemic system. Clinical presentations include encephalopathy, pulmonary hypertension, abnormal liver function and liver tumors. MR imaging and catheter angiography help in better characterization and treatment planning. Early recognition of portosystemic shunts are important due to the adverse effects of shunting on the liver and other organs. Representative cases include absent inferior vena cava, portosystemic shunts (Extrahepatic and Intrahepatic), congenital arteriportal fistula, cavernous transformation of the portal vein, infradiaphragmatic total anomalous pulmonary venous drainage, congenital segmental ectasia of veins, and intrahepatic shunt lesions.

CONTENT ORGANIZATION

Review the embryology of the splanchnic circulation. Understand the vascular imaging techniques including steady state vascular contrast agents. Review common and uncommon vascular malformations of the abdomen with special emphasis on splanchnic circulation. Understand the treatment options for vascular malformations of the liver.

SUMMARY

In this educational exhibit we review the imaging characteristics, clinical implications, and potential treatment options of vascular malformations in the abdomen.

Spectrum of Vascular Anomalies in Children

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CL-PDE4037

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Carina A Ruano , MD
Ana V Nunes
Rita C Carneiro , MD
Maria R Matos , MD
Carla Conceicao , MD
Maria Eugenia Soares

PURPOSE/AIM

Our purpose is to review the imaging spectrum of vascular anomalies in the pediatric group according to the classification system proposed by the International Society for the Study of Vascular Anomalies (ISSVA).

CONTENT ORGANIZATION

1. Terminology proposed by the ISSVA to describe vascular malformation. 2. Brief description of the different lesions. 3. Spectrum of imaging presentation of vascular anomalies in children.

SUMMARY

There are mainly two different categories of vascular anomalies: the vascular neoplasms and the vascular malformations. Vascular neoplasms are characterized by high mitotic index and grow by vasculogenesis (formation of primitive blood vessels from angioblasts) while vascular malformations have normal mitotic index and grow from preexisting vessels (angiogenesis). Infantile hemangioma is the principal neoplasm in the pediatric group. Vascular malformations can be further subcategorized as of low-flow (venous, lymphatic or capillary) and fast-flow (with an arterial component). Ultrasound is the method of choice to a first evaluation and further investigation is usually done by Magnetic resonance imaging.

Ultrasound of the Duodenum in Children - It's™ there, Just Look for It!

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CL-PDE4038

Dana I Dumitriu , MD
Renaud Menten
Philippe R Clapuyt , MD

PURPOSE/AIM

To draw attention to the ability of ultrasound to depict normal anatomy of the duodenum. To systematically review and illustrate pediatric duodenal pathology as demonstrated by ultrasound.

CONTENT ORGANIZATION

Normal ultrasound appearance
Identification of normal position and importance in malrotation
Malformations
Acquired conditions: inflammation, trauma, masses

SUMMARY

The duodenum is accessible to ultrasound in children. The highest frequency transducer which offers enough depth should always be used, in order to obtain high resolution images of the duodenal wall. Identifying the normal position of the duodenum is a solid criterion of normal intestinal rotation. Ultrasound is accurate in determining the level of duodenal obstacles in malformations, even though it cannot always determine their exact nature. In inflammatory conditions ultrasound reveals thickening of the wall and may orient upper gastro-intestinal endoscopy. Masses (tumors, hematomas) are identified as intra- or extra-luminal and characterized in terms of structure and vascularization. In children ultrasound is an effective method to analyze the morphology and dynamics of the duodenum without involving ionizing radiation.

CL-PDE4039

Kiran M Sargar , MBBS,MD
Geetika Khanna , MD,MS

PURPOSE/AIM

1. To review the spectrum of pediatric vasculitis 2. To review the European League against Rheumatism and Pediatric Rheumatology European Society classification of pediatric vasculitis 3. To review the complementary role of various imaging modalities in evaluation of the inflamed vessels and end organ changes.

CONTENT ORGANIZATION

1. Classification of pediatric vasculitis

- Large vessel (Takayasu's)
- Medium vessel (polyarteritis nodosa-PAN, Kawasaki' disease)
- Small vessel (granulomatosis with polyangiitis, non-granulomatous [HSP])
- Other (secondary to drugs, connective tissue disorders)

2. Review the clinical manifestations of common pediatric vasculitis 3. Evidence based approach to imaging of vasculitis at diagnosis and during surveillance. Discuss application of MR/CT angiography, ultrasound, and PET in evaluation of vasculitis. 4. Discuss the imaging findings of common pediatric vasculitis listed above.

SUMMARY

Pediatric vasculitis can cause significant morbidity/mortality, though the prognosis has improved with modern therapeutic agents. Imaging plays a pivotal role in the evaluation of vessel wall and lumen in large/medium vessel vasculitis. The primary role of imaging in small vessel disease is to evaluate the end organ. This review will highlight the imaging findings of common pediatric vasculitis.

Foreign Bodies in Children: Diagnostic Imaging, Complications and Management[Back to Top](#)**CL-PDE4040**

Anjum Bandarkar , MD
Eglal Shalaby-Rana , MD
Nabile M Safdar , MD *

PURPOSE/AIM

1. To review imaging features of a variety of foreign bodies in children to include ingested, aspirated, traumatic and inserted foreign bodies. 2. To illustrate morbidity associated with missed foreign bodies. 3. To discuss imaging management of foreign bodies.

CONTENT ORGANIZATION

1. Four categories of foreign bodies - ingested, aspirated, traumatic and inserted. 2. Radioopaque versus Radiolucent foreign bodies. 3. Each category discussed in depth to include : General principles, Clinical presentation, Imaging approach, Case examples, Complications, and Management. 4. Summary pearls.

SUMMARY

The major teaching points of this exhibit are - 1. Start with a 'nose to rectum' series and add orthogonal views for localisation. 2. Know which ones are radioopaque versus radiolucent. 3. Never rest after finding one foreign body, always look for another. 4. Differentiate battery from coin. 5. Know the complications especially of battery and magnet ingestion. 6. Normal chest radiograph does not rule out foreign body aspiration. 7. In case of traumatic soft tissue foreign bodies with negative radiographs, ultrasound is the study of choice. 8. Recognise when to apply emergent versus expectant management.

Post-transplant Lymphoproliferative Disorder (PTLD) in Pediatric Population: Spectrum of Imaging Findings with Surgical and Pathologic Correlation[Back to Top](#)**CL-PDE4041**

Amir Borhani , MD
David T Fetzer , MD
Golbahar Houshmand , MD
Sameh Tadros , MD, MSc

PURPOSE/AIM

The purpose of this exhibit is: 1) to review the pathogenesis and epidemiology of PTLT, a life-threatening complication of organ transplant, in pediatric population; 2) to illustrate the imaging manifestations in various types of transplantations with pathologic and surgical correlations, and 3) to describe treatment options and monitoring response by radiology.

CONTENT ORGANIZATION

- Definition and pathogenesis of PTLT in pediatric population
- Epidemiology
- Clinical presentations
- Radiological findings: this section describes imaging appearance of PTLT in individual organs (such as liver, spleen, bowel, and lymph nodes) and also discuss pattern of organ involvement based on type of transplantation
- Treatment and monitoring response to treatment

SUMMARY

Major teaching points are: 1) PTLT is a heterogeneous group of tumors that arise in context of immunosuppression after transplant. Epidemiology of PTLT in pediatric population is different from adult population; 2) Early diagnosis can improve response to the treatment and the radiologist has a key role in diagnosis, guiding biopsy, and monitoring response to the treatment; 3) most cases occur during the first year after transplantation; 4) extranodal involvement is very common; 5) there is a wide spectrum of radiological findings.

MDCT/3DCT of Hereditary Multiple Exostoses[Back to Top](#)**CL-PDE4042**

Jan Fritz , MD
Elliot K Fishman , MD *
John A Carrino , MD, MPH *
Laura M Fayad , MD

PURPOSE/AIM

- To review the presentations of hereditary multiple exostoses (HME) and the role of MDCT.
- To discuss technical optimization with low-dose scanning techniques and the added value of 3DCT imaging in the assessment of patients with HME.
- To illustrate the CT appearances of lesions, deformities and complications that occur with HME, along with attention to the post-surgical setting.

CONTENT ORGANIZATION

Epidemiology and pathophysiology Clinical presentations and imaging algorithm for the evaluation of HME Indications for MDCT Optimization

of MDCT acquisition parameters and low-dose scanning techniques MDCT features of uncomplicated HME, variants and mimics MDCT features of complications

- Nerve compression
- Vascular compromise
- Fractures
- Bursa formation
- Muscle tendon abnormalities
- Malignant transformation

Postoperative MDCT imaging
SUMMARY

- Low-dose MDCT, and 3DCT in particular, are powerful tools for the demonstration and characterization of the spectrum of HME manifestations, its variants and mimics.
- The multiplanar and 3D capabilities of MDCT are used for detection and characterization of HME complications.
- Following surgery, in the setting of surgical hardware, 3DCT is especially useful for assessing the HME patient.

The Fungus among Us: Head-to-Toe Imaging of Pediatric Coccidioidomycosis

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CL-PDE4043

Eric C Ehman, MD
Emily R Levy, MD
Jesse L Courtier, MD
Peggy Weintrub, MD
John D MacKenzie, MD

PURPOSE/AIM

The purpose of this exhibit is to: 1. Describe the pathophysiology, demographics and clinical presentation of Coccidioidomycosis in children 2. Review common, multi-modality imaging findings in acute pulmonary and disseminated Coccidioidomycosis and highlight key discriminators from potential mimics 3. Discuss management and follow up options including the role of whole body MRI 4. Test viewer learning and knowledge using a series of image rich, multiple choice questions at the end of the exhibit

CONTENT ORGANIZATION

Content will be organized as follows with multiple X-ray, CT, MRI and Ultrasound examples. I. Overview of Coccidioidomycosis in Children II. Acute Pulmonary Disease: Imaging findings, complications and mimics III. Disseminated Disease: Neurologic, musculoskeletal, abdominal visceral manifestations and mimics IV. Management and Follow Up: Role of whole body MRI VI. Case Based Review Quiz / Summary

SUMMARY

Children infected with *coccidioides immitis* frequently present with vague and non-specific symptoms. Imaging plays a critical role in their evaluation. This exhibit will improve the radiologist's diagnostic accuracy by providing a head-to-toe review of the presentation, key discriminating imaging findings, and clinical management implications in coccidiomycosis infection in children.

Chest MRI in Infants and Children: A Pictorial Review

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CL-PDE4044

Irene M Borzani, MD
Mauro Campoleoni, MD
Laura Merlini, MD
Carla Colombo, MD
Laura V Forzenigo, MD
Pietro R Biondetti, MD

PURPOSE/AIM

Provide an overview of the technology and principles of lung MRI in pediatric patients. Illustrate potential clinical indications and applications of chest MRI through imaging examples. Compare the utility of chest MRI with radiographs, ultrasound and MDCT

CONTENT ORGANIZATION

This exhibit will be structured to present the following: 1- Review acquisition protocols and procedural considerations for chest MR studies in infants and children 2- Present a systematic overview of the indications (cystic fibrosis, follow-up of lung infections, congenital malformations and masses) 3- Compare MRI with other radiological modalities (radiographs, ultrasound and MDCT)

SUMMARY

Among the modalities for lung imaging, MRI has been the latest to be introduced into clinical practice. MR is increasingly being used for evaluating the chest in pediatric patients given its lack of ionizing radiation, the high contrast resolution and good morphological information. Chest MRI may be considered a useful technique in the follow-up of cystic fibrosis or pneumonia or congenital lung malformation in children as an alternative or adjunct to other modalities with at least similar diagnostic value

MR Arthrography of the Shoulder in Adolescent Athletes: Pearls and Pitfalls

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CL-PDE4045

Stacey L Langford
Phuong N Vinh, MD

PURPOSE/AIM

1. To discuss techniques used in arthrography of the adolescent shoulder
2. To review the normal shoulder anatomy of adolescents on MR arthrogram, as well as anatomic variants, particularly those that may mimic disease
3. To explain the imaging appearance of common injuries and other pathology frequently encountered in the shoulder of adolescent athletes, as well as common pitfalls in diagnosis

CONTENT ORGANIZATION

MR arthrography technique in adolescents
Normal adolescent shoulder anatomy on MR arthrogram
Variant anatomy
Disease mimics
Review of imaging findings
Common injuries and conditions of adolescent athletes
Sequelae of injury and other complications
Common incidentals and pitfalls
Sample cases

SUMMARY

1. Shoulder pain is a common complaint in adolescent athletes, sometimes warranting MR arthrography
2. Knowledge of expected anatomy as well as anatomic variants that may simulate disease are important in providing accurate image interpretation

3. Injuries involving the glenoid labrum, joint surface, ligaments, nerves, and rotator cuff muscles not seen on plain radiography are often identified at the time of MRI as well as classic osseous injuries
4. Accurate and prompt diagnosis is essential not only for treatment but also for avoiding potential injury sequelae and complications including premature joint dysfunction

Multimodality Imaging of Complications of Asphyxia in Children

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CL-PDE4046

Bo-Kyung Je, MD, PhD
Ki Yeol Lee, MD, PhD
Ji Yung Choo, MD
Younghen Lee, MD
Sang Hoon Cha, MD

PURPOSE/AIM

- To review the role of imaging modalities in the evaluation of complications of asphyxia
- To demonstrate the state-of-art images

CONTENT ORGANIZATION

In children, neurologic, pulmonary, and renal complications were seen after asphyxia because of these organs' high dependency on oxygen.

- Brain

All patients demonstrated severe global brain damage on initial work-up, regardless of the clinical outcome. US was essential in acute period because of its usefulness in bedside for affected babies. MR was a decisive diagnostic tool in determining the extent and severity of brain injury.

- Chest

CXR findings varied from normal to pulmonary edema, negative pressure pulmonary edema and barotrauma. Chest CT was more precise to demonstrate the extent and location of parenchymal abnormalities.

- Abdomen

US was performed early to detect the visceral damage. US findings included increased renal cortical echogenicity, hypoperfusion of kidneys, bilateral large adrenal hemorrhage, etc.

SUMMARY

The major teaching points of this exhibit are:

- To present a tutorial for complications of asphyxia where the participant can learn the multimodality imaging findings and take the best of multimodalities
- A systematic multimodality imaging is essential for the prompt, safe, and accurate diagnosis in asphyxiated children.

Taking a 'Bite' out of the Mandible: A Wide Spectrum of Mandibular Lesions in the Pediatric Population

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CL-PDE4047

Jordan S Gross, MD
David T Saul, MD
Eric N Faerber, MD

PURPOSE/AIM

Review different lesions and pathologic conditions that involve the mandible in the pediatric population. Various imaging features will be demonstrated in an effort to aid in the diagnosis of these lesions, with an emphasis on CT and MRI.

CONTENT ORGANIZATION

A retrospective, pictorial review of the wide spectrum of lesions involving the mandible at our institution will be presented. The review will be divided into different classifications of mandibular and soft tissue lesions including infectious, congenital, traumatic and neoplastic etiologies. Example will include the more common entities, such as dentigerous cysts and ameloblastoma, as well as rare disease entities, such as mandibular involvement in Caffey's disease. This will be a multimodality review with emphasis on the CT and MRI appearances of these lesions. Treatment and further management will also be described.

SUMMARY

Lesions of the mandible and the surrounding soft tissue are rare, particularly in the pediatric population. Jaw swelling and/or pain may be the most common presentation for many of these conditions, which is non-specific. Therefore, imaging is crucial to the diagnosis. The radiologist plays a key role in establishing the diagnosis as many of these lesions have different treatment and management implications.

Peer Review: Lessons Learned in a Pediatric Radiology Department

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CL-PDE4048

Luana Stanescu, MD
Marguerite T Parisi, MD, MSED
Edward Weinberger, MD *
Ramesh S Iyer, MD

PURPOSE/AIM

To present lessons learned from peer review scores and comments performed at our institution.

To review the traditional diagnostic error classification system.

To characterize an enhanced diagnostic radiology error classification scheme based on our comment-enhanced peer review system.

To review educational examples of various types of diagnostic errors.

CONTENT ORGANIZATION

Describe the ACR/RADPEER peer review scoring system.

Review common and less common error types in diagnostic radiology.

Discuss the educational value of peer review comments shared in a collegial manner.

Describe the role peer review plays in improving diagnostic accuracy and augmenting patient safety.

Provide sample cases for each diagnostic error category.

SUMMARY

Review an enhanced classification of errors in diagnostic radiology with illustrative cases within the scope of pediatric radiology.

Increase awareness of the opportunity peer review comments offer in supporting a departmental culture of teamwork and education.

Ultrasound Imaging of the Paediatric Bowel

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CL-PDE4049

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PURPOSE/AIM

The intestinal tract is a common site of a wide range of acute and chronic diseases in children of all ages. The advances in ultrasound technology and favourable anatomy for sonography mean ultrasound provides an ideal modality for interrogating the paediatric bowel. We will review the anatomy of the bowel wall; ultrasound technique applied to investigating a child; and the clinical presentation and spectrum of pathology demonstrable on ultrasound using our experience as a tertiary referral centre for paediatric gastroenterology.

CONTENT ORGANIZATION

1. Technique of examination
2. Bowel anatomy
3. Clinical presentation of common gastrointestinal disease in children
4. Inflammatory bowel disease - diagnosis and follow-up
5. Mechanical bowel obstruction- intussusception and pyloric stenosis
6. Appendicitis and mesenteric adenitis
7. Malignant disease.
8. Other pathology

SUMMARY

Ultrasound represents a rapid, easily accessible, and accurate diagnostic tool in the young abdomen; with the added benefit of avoiding exposure to ionising radiation. As such it is now widely used to characterise and follow up pathological change in a wide range of inflammatory conditions affecting the paediatric bowel. A degree of experience is required and a methodical examination technique is necessary in order to recognise and characterise the presenting pathology.

Normal Skeletal Maturation in the Pediatric Shoulder: Imaging Pitfalls

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CL-PDE4050

Jonathan S Zember , MD
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Steven Kwong
Shefali P Kothary , MD

PURPOSE/AIM

The developing pediatric shoulder is unique due to its bipolar growth plate and at least 9 secondary ossification centers. The focus of this exhibit is to illustrate various imaging pitfalls, inherent to the normal skeletal maturation of the shoulder, and to provide clues for distinguishing these pitfalls from true disease. Many of the featured pitfalls, to the best of our knowledge, have not yet been reported in the literature.

CONTENT ORGANIZATION

The exhibit will be divided into two parts. A. This section, utilizing drawings, radiographs, CT and MRI, will be devoted to the normal, sequential maturation pattern of the proximal humerus, glenoid, coracoid and acromion. B. This section will focus on various interpretation pitfalls in imaging of the shoulder. Normal developmental patterns simulating glenoid, coracoid and acromial avulsion fractures, acromioclavicular separation, labral tear, tendon disorder, intraosseous abscess, periosteal reaction and marrow signal abnormality will be featured with clues to distinguishing them from true disease.

SUMMARY

Familiarity with the normal imaging anatomy and pitfalls, related to the unique, normal skeletal maturation of the shoulder, is crucial for accurate interpretation of the pediatric shoulder.

Fast MRI Appendix: Implementation and Diagnostic Principles of an Emergent Pediatric MRI Imaging Protocol

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CL-PDE4051

Lauren A May , MD
Robert M DeWitt , MD
Christian L Carlson , MD, MS

PURPOSE/AIM

1. Review literature supporting the utilization of MRI in the pediatric patient with acute appendicitis 2. Discuss the Fast MRI Appendix protocol implemented at our non-pediatric tertiary medical center 3. Review key MRI findings associated with acute appendicitis as well as findings for other abdominal pathology often encountered on the Fast MRI Appendix exam 4. Present data from the initial pediatric patients imaged at our institution supporting the practical role of MRI in the emergent setting

CONTENT ORGANIZATION

1. Review literature documenting MRI accuracy in evaluation of appendicitis 2. Describe our appendicitis imaging protocol: KUB, Ultrasound, MRI 3. Discuss the four sequences utilized in the Fast MRI Appendix protocol 4. Illustrate key MRI findings of appendicitis and other acute intra-abdominal pathology often seen on Fast MRI Appendix 5. Present results of the initial patients that underwent MRI evaluation for appendicitis at our institution a. Correlation of MRI results with clinical and surgical outcome b. Statistical discussion of MRI effectiveness in appendicitis evaluation 6. Discuss the technical and financial limitations of MRI

SUMMARY

Major Teaching Points: 1. Fast MRI Appendix is an effective method to evaluate appendicitis in pediatric patients. 2. Review of key MRI features of appendicitis and the normal appendix.

Local Diagnostic Reference Level (DRL) Based on Size-specific Dose Estimates (SSDE) in Pediatric Abdominal Computed Tomography

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CL-PDE4052

Rumi Imai
Osamu Miyazaki , MD
Tetsuya Horiuchi

PURPOSE/AIM

CONTENT ORGANIZATION

SUMMARY

-The local DRLs of CTDI vol/SSDE were as follows (mGy): 1y:3.53/3.67, 5y:1.97/4.17, 10y:2.91/5.38, 15y:9.0/14.48. These DRLs, established by SSDE, were useful for quality-assurance purposes, because the DRLs were not influenced by phantom size, although the CTDI vol was directly affected by the choice of two phantom sizes (16-cm or 32-cm dia.).

-Pediatric radiologists can use the SSDE when assessing risk versus benefit for pediatric patient prior to the performance of a CT scan.

CL-PDE4053**Beverly A Thornhill** , MD**Jessica Kurian** , MD**Benjamin Taragin** , MD**PURPOSE/AIM**

The purpose of this exhibit is to familiarize the viewer with radiographic and cross-sectional imaging appearances of the most commonly encountered findings in the pediatric appendicular skeleton that simulate disease: 1) Variations in normal ossification of skeletal structures 2) Benign entities that should be diagnosed with confidence

CONTENT ORGANIZATION

Examples and discussion including but not limited to:

- Normal variations in the pediatric appendicular skeleton:
 1. Variable appearance of selected ossification centers such as pisiform, acromion, distal femur
 2. Vascular channels
 3. Bicipital tuberosity
 4. Rhomboid fossa
 5. Ischiopubic synchondrosis
 6. Overlap of normal structures (e.g. at the first tarsal-metatarsal joint)
- Entities that should not be pursued except to evaluate for complications such as a fracture or bursa formation:
 1. Non-ossifying fibroma
 2. Cortical avulsive irregularity at distal femur and deltoid tuberosity
 3. Osteochondroma

SUMMARY

The viewer should gain knowledge about the appearances of common findings in the pediatric appendicular skeleton that may simulate disease. Deficient knowledge in these areas may cause unnecessary anxiety for the radiologist, referring physician and the patient. Augmented knowledge will empower the radiologist to diagnose with confidence.

Glenohumeral Instability in Children - Spectrum of Findings on MRI of the Shoulder**CL-PDE4054****Bo Arys** , MD**Murray J Bartlett** , MBBS**PURPOSE/AIM**

Lesions of the glenoid labrum and the ligamentous structures of the shoulder are a frequent cause of shoulder joint instability and are ideally evaluated with MRI. In our study, we have reviewed the MRI examinations of 30 pediatric patients referred with shoulder instability symptoms and evaluated the appearance and incidence of the encountered lesions. The purpose of this review is to describe the MRI abnormalities encountered in this specific clinical setting in a skeletally immature population and correlate these to the findings commonly seen in adults.

CONTENT ORGANIZATION

. MRI of the normal pediatric shoulder . Osseous lesions . Labral lesions . Rotator cuff muscle injury . Ligamentous trauma . Associated findings . Pediatric versus Adult shoulder instability . Take home message

SUMMARY

Major teaching points are: . Familiarize readers with the different types of lesions that can be encountered, both after acute dislocation and in chronic instability. . Being able to recognize pathology from normal skeletal immature anatomy, especially of importance with chronic injuries. . Knowing the similarities and differences in expected findings in unstable shoulders in a pediatric population versus the adult population.

MRI of the Uncommon Infratentorial Pediatric Tumors**CL-PDE4055****Ricardo Corrales Pinzon****Cecilia Santos Monton****Francisco Menor****Angel Losa-Palacios****Teresa Gonzalez De La Huebra Labrador****Pilar Sanchez De Medina Alba****PURPOSE/AIM**

The purpose of this exhibit is:

- To review the MRI findings of some rare infratentorial pediatric tumors.
- To explain the utility of MRI and particularly diffusion-weighted imaging, spectroscopy and perfusion in the diagnosis.
- To discuss the radiological MRI differences between the uncommon and common infratentorial pediatric brain tumors.

CONTENT ORGANIZATION

Review the MRI findings of the following infratentorial pediatric tumors.

- Cerebellar Rosai-Dorfman Disease.
- Meningioma arising in the IV ventricle.
- Choroid plexus papilloma of the IV ventricle.
- Schwannoma of the X Cranial Nerve.
- Clivus chondroid chordoma.

Stress the key data to exclude the more common infratentorial pediatric brain tumors. To emphasize the importance of MRI findings specially diffusion-weighted imaging, spectroscopy and perfusion in the diagnosis of the infratentorial tumors in children. Sample cases and mimic.

SUMMARY

The major teaching points of this exhibit are:

- To present our experience in a tertiary hospital regarding some extremely rare infratentorial pediatric tumors.
- To show some key imaging findings that will guide us to diagnose these unusual infratentorial pediatric tumors versus the more common pediatric brain tumors seen in this location.

Radiographic Evaluation, Classification and Postsurgical Imaging of Congenital Lower Extremity Shortening- Femoral Deficiency, Fibular Dysplasia and Tibial Dysplasia-A Pictorial Essay

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CL-PDE4056

Maria Alejandra Bedoya Velez , MD
Diego Jaramillo , MD, MPH
Victor M Ho-Fung , MD

PURPOSE/AIM

The objective of this exhibit is to provide an educational review of the imaging, classification and postsurgical assessment of proximal focal femoral deficiency (PFFD), fibular dysplasia (fibular hypoplasia/fibular hemimelia) and tibial dysplasia in the pediatric population.

CONTENT ORGANIZATION

- 1) Normal radiographic imaging, anatomy, and embryology of the lower extremity
- 2) Clinical findings, imaging anatomy, classification, and postsurgical imaging of congenital lower extremity shortening:
 - a. Proximal focal femoral deficiency
 - b. Fibular Dysplasia (fibular hemimelia and fibular hypoplasia)
 - c. Tibial dysplasia

SUMMARY

Congenital lower extremity shortening is a rare entity with a broad spectrum of manifestations. There is a limited amount of literature available in the topic which makes clinical and radiologic evaluation challenging. After completion of this educational review the participant should be able to outline the spectrum of imaging findings, developed a differential diagnosis, understand the classification, and the surgical management of congenital lower extremity shortening.

Imaging Updates for Pediatric Right Lower Quadrant Pain in a New Gentle Imaging World

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CL-PDE4057

Mingming Ma , MD
Alex C Penn , MD
Bo Yoon Ha , MD

PURPOSE/AIM

1. Review imaging findings of various pathologies presenting with right lower quadrant pain in pediatric patients
2. Discuss the optimal imaging algorithm in the evaluation of right lower quadrant pain, with application of the ALARA principle

CONTENT ORGANIZATION

- Cases include, but are not limited to: acute appendicitis, intussusception, infectious colitis, epiploic appendagitis, small bowel obstruction, fecal impaction, mesenteric cyst, ureteral stone, ureteral polyp with hydronephrosis, hemorrhagic ovarian cyst, ovarian torsion, endometritis, and torsion of an undescended testicle.
- Presentation of cases in a quiz format followed by
 - Characteristic ultrasound and computed tomography findings with review of relevant anatomy and potential pitfalls
 - Surgical and pathologic correlation when available
- Discussion of a staged US and CT imaging algorithm based on our retrospective review of 674 pediatric patients from the past 36 months.

SUMMARY

Evaluation of right lower quadrant pain in pediatric patients warrants consideration of various alternative pathologies besides acute appendicitis. Adopting an optimal imaging algorithm and awareness of potential pitfalls is crucial in reducing radiating exposure without compromising diagnostic accuracy.

Comprehensive Understanding Radiation Dose Reduction at Pediatric CT

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CL-PDE4058

Chihiro Tani , MD
Yukiko Honda , MD
Yoko Kaichi
Daisuke Komoto , MD
Shuji Date
Kazuo Awai , MD *

PURPOSE/AIM

The purpose of this exhibit is to:

1. Provide basic knowledge about radiation dose measurements at CT
2. Demonstrate the lifetime attributable cancer risks from pediatric CT
3. Utilize new technologies for dose reduction at CT
4. Implement the dose reduction at pediatric CT in daily practice

CONTENT ORGANIZATION

1. Basic knowledge about measuring the radiation exposure from CT
 - CT dose index (CTDI)
 - Dose length product (DLP)
 - Effective radiation dose
2. Lifetime attributable cancer risks from pediatric CT
3. New techniques for radiation dose reduction at CT
4. Clinical implementation of radiation dose reduction at pediatric CT
 - CT protocols adapted to the body size, clinical indication, and number of prior studies
 - Low kV scan technique

SUMMARY

1. Pediatric CT may raise the lifetime attributable cancer mortality risks because of increased clinical indications and its iterative use
2. Pediatric CT protocols should be modified based on the body size, clinical indication, and number of prior studies in each patient
3. Low kV CT techniques are indicated at pediatric CT because they can simultaneously reduce the delivered radiation dose and improve contrast.

Pediatric Body MR Angiography: Principles, Sequences and Current Utility

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CL-PDE4059

Govind B Chavhan , MD
Paul S Babyn , MD
Philip R John , MBBCh, FRCR
Shi-Joon Yoo , MD
Cynthia K Rigsby , MD

PURPOSE/AIM

1. To discuss principles, sequences and types of MR Angiography (MRA) in pediatric body MR imaging. 2. To illustrate role and current utility of MRA and its pediatric body applications.

CONTENT ORGANIZATION

@ Principles and sequences for MRA @ Non-contrast MRA- Time of flight, phase contrast, Balanced SSFP based and ECG-gated FSE MRA @ Contrast-enhanced MRA- CEMRA and Time-resolved/4D MRA @ Comparison of MRA, CTA and conventional Angiography @ Current applications of MRA within the Abdomen (general, renal, portal hypertension), Extremities, Thorax and whole-body MRA @ Pitfalls of MRA @ Summary

SUMMARY

MR Angiography and its utility in pediatric body imaging are still evolving. Many non-contrast MRA techniques are emerging but contrast-enhanced MRA still remains the most reliable method of vascular assessment. Applications of MRA in pediatric body include renal artery stenosis, tumor assessment, portal hypertension, vasculitis, trauma, vascular malformations, thoracic outlet syndrome and others. Familiarity with its techniques and normal appearances along with current applications would be beneficial for pediatric radiologists.

Renal Pediatric Tumors: Imaging Approach according to the Most Important International Working Groups Requirements

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CL-PDE4060

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Marcel Koenigkam Santos , MD, PhD
Silvio Tucci , MD, PhD
Jorge Elias , MD, PhD
Gyl E Silva , MD, PhD

PURPOSE/AIM

By a radiologic-pathological correlation illustrate pediatric renal cancers, and discuss the role of imaging methods in diagnosis and staging, according to requirements defined by main protocols, currently used: the Children's Oncology Group (COG Société Internationale D'oncologie Pédiatrique (SIOP) and National Wilms Tumor Study (NWTs).

CONTENT ORGANIZATION

Review the histological classification of pediatric renal cancer and the most recent advances in molecular analysis of these tumors; discuss important clinical and laboratory findings; review imaging findings of the most common pediatric renal tumors, with emphasis on key findings that allow a more accurate diagnosis; discuss the role of imaging methods in diagnosis and staging, according to requirements defined by main protocols, currently used.

SUMMARY

Renal malignancies are one of the most prevalent cancers in this group of patients. Imaging plays an essential role by suggesting the primary diagnosis and for an accurate preoperative staging, which is essential for prognosis and choosing the most adequate therapeutic approach. The knowledge of key imaging findings in association with specific clinical features may provide clues for the best diagnostic assessment

Sticking Your Neck Out: Distinguishing Malignant from Benign Thyroid Disease in Children

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CL-PDE4061

Nishard Abdeen , MD
Nazih Shenouda , MD
Amer Alaref , MD
Jorge H Davila Acosta , MD
Alireza Khatami , MD

PURPOSE/AIM

The purpose of this exhibit is to: 1. Discuss key features distinguishing malignant from benign thyroid disease in children in a case based format, particularly the imaging approach to the pediatric thyroid mass. 2. Discuss the strengths and weakness of US, CT, MRI and nuclear medicine in the evaluation of thyroid disease in children .3. Imaging appearance of other thyroid diseases which could mimic malignancy in children.

CONTENT ORGANIZATION

1. Embryology of the thyroid gland 2. Strengths and weaknesses of ultrasound, CT, MR and nuclear medicine in evaluation of thyroid disease 3. Malignant masses (thyroid carcinoma) with particular reference to features of malignancy and unusual presentations 4. Benign masses (colloid cyst, thyroid adenoma, thyroid cyst) 5. Congenital masses (ectopic thyroid, congenital goiter, thyroglossal duct cyst) 6. Diffuse thyroid disease presenting as focal disease (Hashimotos thyroiditis, Graves disease, subacute thyroiditis).

SUMMARY

Familiarity with the imaging approach to thyroid disease in children will allow the radiologist to make an accurate diagnosis of congenital conditions, diffuse thyroid diseases and thyroid masses, and most importantly identify thyroid malignancy.

Cardiovascular Manifestations of Williams Syndrome: Imaging Findings

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CL-PDE4062

Aleksander Krazinski
James C Gray , BA
U. Joseph Schoepf , MD *
Felix G Meinel , MD
Nicholas P Pietris , MD
Anthony M Hlavacek , MD

PURPOSE/AIM

Williams syndrome is a relatively common (1 in 7,500 live births) genetic disorder caused by a deletion involving chromosome 7 that results in a broad variety of clinically significant abnormalities, including developmental delay, behavioral changes, hypercalcemia, and a distinct 'elfin' facial appearance. Congenital cardiovascular disease presenting in childhood is responsible for most of the morbidity and mortality associated with this disorder. The purpose of this exhibit is to review imaging findings of some of the more common cardiovascular manifestations of Williams Syndrome as well as to highlight some of the unique anatomical variations that can be seen in these patients.

CONTENT ORGANIZATION

1. Epidemiology and pathophysiology of Williams syndrome.
2. Most common cardiovascular findings on imaging: supra-valvular aortic stenosis, pulmonary arterial stenosis and aortic hypoplasia
3. Other imaging findings and anatomical variants
4. Imaging protocols for pediatric patients with Williams syndrome: radiation dose considerations
5. Prognosis and treatment of Williams syndrome

SUMMARY

Williams syndrome is a disorder with significant cardiovascular morbidity and mortality. Knowledge of the characteristic imaging findings is essential to recognize the disease and to assess the severity of cardiovascular involvement.

CL-PDE4063

Carmina Duran , MD
Luis Riera Soler , MD
Marta Cufi Quintana
Cesar Martin Martinez , MD

PURPOSE/AIM

The purpose of this work is showing the different standard and color Doppler US patterns of the most relevant prepubertal scrotal tumors, using specific color Doppler US presets for the vascular study of prepubertal testis.

CONTENT ORGANIZATION

A revision of standard and color Doppler US findings in prepubertal testicular tumors (7 patients aged -Heterogeneous intratesticular cystic/solid lesions were teratomas (2 patients).

-A solid isoechoic intratesticular mass was finally diagnosed as a Yolk-sack carcinoma.

-2 patients with solid extratesticular tumors (with a layered appearance) corresponded to rhabdomyosarcomas.

Concerning color Doppler findings we observed that Yolk-sac tumor and rhabdomyosarcomas showed hyperemia, simulating other lesions like inflammatory diseases or hemangioma.

SUMMARY

Prepubertal scrotal tumors are rare. An accurate assessment of their US appearance (including color Doppler findings) is of vital importance not only for their diagnostic but to select a correct treatment and improve consequently their management.

Voiding Urosonography: A Pictorial Essay of the Lower Urinary Tract Pathology**CL-PDE4064**

Carmina Duran , MD
Luis Riera Soler , MD
Marta Cufi Quintana
Cesar Martin Martinez , MD

PURPOSE/AIM

Voiding urosonography (VUS) has demonstrated being able to obtain high quality morphologic studies of the urinary tract. This poster is a pictorial essay of the lower urinary tract pathology VUS has been able to identify to the present.

CONTENT ORGANIZATION

Between October 2005 and December 2012, we performed VUS in about 1300 patients (

SUMMARY

Despite the low prevalence of congenital lower urinary tract lesions VUS is progressively proving that is able not only to perform a correct morphological study of the male urethra, but it also allows the specific diagnosis of congenital urinary tract anomalies.

Eye Sonography in Paediatric Patients: A Pictorial Review**CL-PDE4065**

Olivia Carney , FFRCSI
Angela T Byrne , FFRCSI

PURPOSE/AIM

The purpose of this pictorial review is to describe and illustrate the normal anatomy and pathological findings encountered during eye sonography in children.

CONTENT ORGANIZATION

Review indications for eye sonography in children; many present with same clinical sign-leukocoria or 'white pupil'. Sonographic review of normal eye anatomy and eye pathology in paediatric patients including neoplastic causes of leukocoria (retinoblastoma), non-neoplastic causes of leukocoria (detached retina, retinopathy of prematurity, persistent hyperplastic primary vitreous, Coat's disease, coloboma and optic drusen), vascular malformations (haemangioma), cataracts, infection, foreign body and trauma (vitreous haemorrhage). Images were acquired using high resolution 7.5-15 MHz linear transducers with water-soluble ultrasound gel applied to the patient's closed eyelid.

SUMMARY

Eye sonography has significant application for primary assessment and follow-up of eye pathology in children. This pictorial review illustrates the normal and abnormal findings encountered during eye sonography in paediatric patients. Ultrasound is a valuable tool in the evaluation of the paediatric eye and offers several advantages compared to MRI and CT. It is non-invasive and cost effective. Most importantly it avoids the irradiation associated with CT and the need for sedation in children.

Think Outside the Bowel: Top 5 Commonly Missed Extra-intestinal Complications of Pediatric Inflammatory Bowel Disease and How to Catch Them on MRI**CL-PDE4066**

Eric C Ehman , MD
Andrew S Phelps , MD
Peter A Marcovici , MD
Patrika M Tsai , MD
John D MacKenzie , MD
Jesse L Courtier , MD

PURPOSE/AIM

Children with Inflammatory Bowel Disease (IBD) are at increased risk of comorbidities and complications compared with adults

- Review common and commonly overlooked IBD complications on MR Enterography (MRE) using an interactive quiz format
- Present an algorithm for identifying these complications
- Discuss key discriminating features and management options

CONTENT ORGANIZATION

I. Overview of role of MRE in pediatric IBD assessment-- patient selection, imaging technique, strengths and limitations II. Brief review of intestinal findings of Crohn's disease and UC (with examples)--wall thickening, mural stratification, mucosal hyperenhancement, strictures, fat stranding and comb sign III. Interactive quiz format review of important complications of pediatric IBD including:

- Abscesses (intra- and extra-mural)
- Fistulous tracts (including entero-vesicular and peri-anal disease)
- Biliary disease (stones or inflammatory disease)
- Musculoskeletal (sacroiliitis, osteomyelitis and intramuscular abscesses)
- IBD mimics (infectious, tuberculosis, neoplastic and mesenteric lymphadenopathy)

SUMMARY

Children with IBD are at increased risk of comorbidities and complications compared with adults. This exhibit will help the viewer to detect subtle complications using MR Enterography and understand the management implications.

Metastatic Neuroblastoma: Beyond the Bones

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CL-PDE4067

Emily S Orscheln, MD
Luke L Linscott, MD
Alex Towbin, MD *
Brian D Weiss, MD
Susan E Sharp, MD

PURPOSE/AIM

Bone marrow and cortical bone are the most common sites of metastatic disease in neuroblastoma and medical imagers are well aware of the skeletal manifestations of metastatic neuroblastoma. Extraskelatal metastases occur and range in frequency from relatively common (liver and skin), to uncommon (lung and brain), to rare (kidney and pancreas). The aim of this exhibit is to describe the clinical and imaging spectrum of solid organ and soft tissue neuroblastoma metastases through a case-based review, helping participants to more skillfully interpret images in children with neuroblastoma.

CONTENT ORGANIZATION

1. Introduction to the clinical and imaging manifestations of neuroblastoma.
2. Briefly review skeletal metastatic disease in neuroblastoma.
3. Case-based review of extraskelatal neuroblastoma metastases, including:
 - a. More common sites such as liver and soft tissues
 - b. Less common sites such as lung and central nervous system
 - c. Rare sites such as kidney and pancreas

SUMMARY

Identification of metastatic disease is integral to disease staging and treatment planning. While skeletal metastases in neuroblastoma are common, its metastatic potential can extend far beyond the bones to involve virtually any organ system of the body. After reviewing this exhibit, participants will be comfortable with the broad spectrum of neuroblastoma metastatic disease.

Correlation of the Intracranial Lesions on Fetal MRI to that on the Postnatal MRI

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CL-PDE4068

Tetsu Niwa
Noriko Aida, MD
Kumiko Nozawa
Tomoaki Nagaoka
Yutaka Imai

PURPOSE/AIM

1. To review the various intracranial abnormalities on fetal MRI
2. To discuss the detectability and limitations of the intracranial lesions on fetal MRI, correlated to the postnatal MRI
3. To explain the utility and limitation of the intracranial lesions on that on the fetal MRI

CONTENT ORGANIZATION

Pathophysiology that can be occurred in the fetal brain along with the development

Review the imaging sequence for fetal imaging

Review of various intracranial lesions on the fetal MRI, from the point of view of the anatomical location, and imaging sequence.

Discuss the detectability and limitation of the intracranial lesions on fetal MRI, correlated with postnatal MRI

Future directions and summary

SUMMARY

The major teaching points of this exhibit are:

1. Morphological abnormalities are well visualized on fetal MRI
2. There are limits to assess the contrast of the lesion
3. White matter lesions are less detectable on fetal MRI

Susceptibility and Phase Imaging of the Neonatal Brain

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CL-PDE4069

Tetsu Niwa
Noriko Aida, MD
Kumiko Nozawa
Tetsuya Yoneda, PhD *
Yutaka Imai

PURPOSE/AIM

1. To present utilities of susceptibility-weighted imaging (SWI) of the neonatal brain.
2. To understand the utilities of the phase data.
3. To discuss the possible utilities of the phase data and image for the analysis of the brain development.

CONTENT ORGANIZATION

Present a basis of SWI for the use of the neonatal brain.

Review of imaging findings of the neonatal brain using SWI

- Various types of intracranial hemorrhage

- Venous lesions

Discuss how the SWI contributes to the diagnosis

Present a basis of phase data and phase image.

Utilities of the phase image of the neonatal brain

Future directions and summary

SUMMARY

The major teaching points of this exhibit are:

1. SWI sensitively demonstrates intracranial hemorrhagic and the venous lesions of neonates.
2. Consideration of the hemorrhagic location and hemorrhagic component in the lesion is often useful for understanding the neuropathology.
3. Phase image and phase data can be utilized for the analysis of the development of the neonatal brain.

Pediatric Hepatic Venous Outflow Obstruction-Tertiary Liver Centre Experience

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CL-PDE4070

Shalini T Laroia, MD
Vikrant Sood, MD

Rajeev Khanna , MD
Seema Alam , MD
Shiv Sarin

PURPOSE/AIM

To evaluate the role of imaging in diagnosis and management of hepatic venous outflow obstruction in the pediatric age group.

CONTENT ORGANIZATION

Material and Methods: All children under 18 years with suspected deranged coagulation profile and hepatic venous outflow tract obstruction (HVOTO) were included in the study group.

50 children were assessed over 2 years. Doppler, dynamic CT / MRI of the liver were performed and evaluated for HVOTO. Liver biopsy was performed, whenever indicated. Endovascular management including angioplasty, stenting, Trans-jugular (TIPS) or direct intrahepatic porto systemic shunt (DIPS), living donor liver transplant and conservative methods were used for treatment, with subsequent radiological follow up. Results: Of the total 50 patients evaluated for HVOTO a definitive primary diagnosis was made in 10 patients. Treatment offered was as follows:

- a) Conservative therapy = 6
- b) Angioplasty = 1
- c) Angioplasty + stenting= 2
- d) TIPS= 3
- e) DIPS= 1
- f) Liver Transplant=1

Complications:

Mortality = 1 (In patient with liver transplant due to secondary sepsis)

Blocked stent post TIPS= 1

Repeat angioplasty=1

SUMMARY

HVOTO is an uncommon primary clinical diagnosis in children. Imaging is the main forte of diagnosis and management. The pediatric sub-group of HVOTO is best managed in a tertiary liver care centre.

The Role of Combined Voxel Based Morphometry (VBM) and Diffusion Tensor Imaging (DTI) in Quantification and Segmentation of Different Grey Matter (GM) and White Matter (WM) Structures in Preterm Babies with Peri Ventricular Leukomala (PVL)

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CL-PDE4071

Ruma M Sreedharan
Harikumaran Nair G S , MBBS, DMRD

PURPOSE/AIM

1.To assess the pathophysiology underlying the changes in Grey Matter and White Matter in preterm babies using DTI and VBM. 2. To quantify the reliability of different VBM and DTI techniques to assess microstructural changes to grey and white matter in preterm babies.

CONTENT ORGANIZATION

Pathophysiology of PVL

PVL is a type of brain injury classically described in pre term infants and is characterized by focal or diffuse ischemic changes leading to coagulative necrosis and cystic degeneration in the peri ventricular

MR imaging show dilated ventricles, scalloping of ventricular margin, peri ventricular white matter thinning, atrophy and corpus callosal dysgenesis . **Role of DTI and VBM**-Specific involvement of WM tracts and quantification of affected WM fibres is possible only with MR DTI , .Various indices like Fractional Anisotropy (FA) , Mean Diffusivity (MD)and Fibre density index(FDI) are measured.VBM give volumetric measurement of grey matter structures like thalami, basal ganglia and WM structures like Corpus Callosum.

SUMMARY

The major teaching points are 1.MRI can grade PVL 2.VBM and DTI can delineate microstructural alterations in grey and white matter . 3.Combined DTI and VBM can be used in assessing the extent of injury to white matter tracts as well as quantification of grey matter loss even before it is clinically apparent.

Radiographic Spectrum of Juvenile Idiopathic Arthritis (JIA): From Diagnosis to Treatment

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CL-PDE4072

Nucharin Supakul , MD
Boaz Karmazyn , MD

PURPOSE/AIM

1. To optimize imaging in evaluation of Juvenile Idiopathic Arthritis (JIA).
2. To recognize limitation and advantages of each imaging modalities including plain radiograph, ultrasound (US) and Magnetic Resonance Imaging (MRI) in diagnosis and plan treatment of JIA.
3. To demonstrate classic imaging findings of JIA.
4. To understand US technique and be familiar with the findings of JIA.

CONTENT ORGANIZATION

1. Introduction
2. Clinical presentation and differential diagnosis
3. Characteristic imaging findings from each modality.
4. US technique and interpretation
5. Treatment options
6. Sample cases
7. Summary

SUMMARY

1. JIA is one of the most common causes of chronic arthritis in children, which cannot be distinguishable from other juvenile spondyloarthropathies by radiographic findings.
2. US is one of the useful imaging modality, tailored to help differential diagnosis and guided treatment in case of peripheral joints involvement.
3. Pediatric radiologists should be familiar with the US technique and findings of JIA to guide diagnosis and treatment.

Gadoxetate Disodium in the Pediatric Population: A Review of Magnetic Resonance Imaging Features of Pediatric Hepatic Lesions

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CL-PDE4073

William F Browne , MD
Daniel S Chow , MD
Mark R Escudero , MD
Gerald G Behr , MD

PURPOSE/AIM

Gadoxetate disodium (Gd-EOB-DTPA) is an emerging hepatobiliary MRI contrast agent used in adults to characterize hepatic lesions; however, its use in the pediatric population is not well described. The goals of this exhibit are to:

1. Provide a pictorial review of MRI findings in benign and malignant pediatric liver lesions.
2. Describe the use of Gd-EOB-DTPA in the pediatric population.

At the end of the exhibit, an interactive quiz will be provided for individuals to assess their knowledge.

CONTENT ORGANIZATION

1. Epidemiology of pediatric hepatic lesions
2. Pictorial review of benign hepatic lesions
3. Pictorial review of malignant hepatic lesions
4. Use of Gd-EOB-DTPA in the pediatric population

SUMMARY

1. Radiologists should be familiar with the MRI features of hepatic lesions in order to distinguish benign from malignant conditions.
2. The use of Gd-EOB-DTPA represents a new tool in further characterization of pediatric hepatic lesions.

Pediatric Liver Disease: Imaging Features of Pathology and the Role of Interventional Radiology in Management

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CL-PDE4074

Narendra S Shet, MD
Nghia Vo, MD

PURPOSE/AIM

Liver disease, either congenital or acquired, is relatively common within the pediatric population, and often encompasses disease entities distinct from those encountered in the adult world, particularly when masses (benign or malignant) are considered. The purpose of this educational exhibit is to demonstrate the imaging appearance of various pediatric hepatobiliary pathologies, with emphasis on modalities limiting exposure to radiation. Furthermore, the role of imaging in guiding diagnostic and therapeutic procedures is discussed.

CONTENT ORGANIZATION

Liver Imaging: Review of Modalities Focal Abnormalities:

- Benign Masses
- Malignant Masses
- Non-Neoplastic Masses Diffuse Processes:
- Biliary Tract Pathology
- Vascular Pathology
- Parenchymal Pathology The Role of Interventional Radiology:
- Diagnostic Procedures (biopsy, aspirate)
- Therapeutic Procedures (drain placement, TIPS, chemoembolization) Summary

SUMMARY

The pediatric liver can be affected by a variety of pathologies often distinct to the pediatric population. Imaging features of these abnormalities can narrow diagnostic considerations, often without the use of ionizing radiation. Furthermore, the use of imaging can further assist in management by providing guidance for diagnostic and therapeutic interventional procedures.

Come See the Various Side of Adrenal Gland in Pediatrics

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CL-PDE4075

Hyun Jung Koo, MD
Younghoon Cho
Hye-Kyung Yoon, MD
Jin Seong Lee, MD
Chong Hyun Yoon
Weekyoung Kim

PURPOSE/AIM

To demonstrate various pediatric adrenal lesions for appropriate diagnosis and management in pediatric patients.

CONTENT ORGANIZATION

1. Introduction

- Normal anatomy
- Anatomic variations
- Congenital anomaly
- 2. Evaluation of pediatric adrenal gland
- Diagnostic imaging plans
- Imaging techniques
- Management strategies for pediatric adrenal lesions
- 3. Various pathologic conditions

A. Tumorous conditions

- Neurogenic tumors: neuroblastoma, paraganglioma
- Pheochromocytoma
- Teratoma
- Adenoma and adenocarcinoma
- Metastasis
- Rare tumors
- B. Non-tumorous conditions
- Congenital adrenal hyperplasia
- Congenital lipoid adrenal hyperplasia
- Adrenal gland hemorrhage
- Adrenal tuberculosis
- Wolman disease
- C. Adrenal tumor mimicking lesions
- Retroperitoneal lesions
- Renal lesions
- Liver lesions

SUMMARY

Congenital anomalies, acquired tumorous or nontumorous lesions in pediatric adrenal glands could be differentiated by the imaging modalities; ultrasound, computed tomography and magnetic resonance imaging. Because the management for each lesion is different, the imaging findings of various conditions involving adrenal gland could be valuable information to make an accurate diagnosis. In this presentation, diagnostic strategies and follow-up studies for pediatric adrenal gland will be demonstrated.

Added Value of MRI in Isolated Orofacial Clefts: Why? How? When?

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CL-PDE4076

Alexia Dabadie
Edwin Quarello
Nathalie Degardin
Harmony Pico
Raoul Desbriere

Beatrice Guidicelli
Helene Heckenroth
Nicole Philip
Sabine Sigaudy
Guillaume Gorincour , PhD

PURPOSE/AIM

To understand the added value of fetal MRI used conjointly with ultrasound screening in the work-up of isolated orofacial clefts.

CONTENT ORGANIZATION

1. Dynamic step-by-step analysis of the normal and abnormal embryology of the fetal face
2. Up-to-date performances of ultrasonography for the diagnosis of orofacial clefts
3. Added value of MRI in isolated orofacial clefts: Why? How? When?
4. Classification of orofacial clefts revisited through ultrasonography, MRI and neonatal correlations
5. Benefits for the fetus, the parents, and the multidisciplinary medico-surgical team

SUMMARY

Isolated orofacial clefts concern 1/700 births. Their prenatal diagnosis leads to major consequences for the parents, but also for the prenatal counseling, follow-up and postnatal care of their baby to come. Fetal ultrasonography (US), when performed by a trained physician, allows the diagnosis of cleft with a sensitivity up to 63% according to the literature. Fetal MRI, thanks to high contrast resolution, is an interesting additional tool in situations of sub-optimal foetal and/or maternal conditions. Its reproducibility and easier understanding by the surgical team are some valuable arguments that should lead multidisciplinary teams to encourage its use.

Ultrasound Evaluation of Pavlik Harness in Treatment of Infants with Developmental Dysplasia of the Hip: Prone Axial Approach to Harness in Situ

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CL-PDE4077

Claudia P Fernandez
Maria Guasp
Jacinto Gomez Fernandez-Montes

PURPOSE/AIM

To describe a practice guideline for the performance of the ultrasound (US) control of pavlik harness to monitoring the treatment of hip developmental dysplasia of the hip (DDH).

CONTENT ORGANIZATION

Technique

1. Equipment specifications.
2. Position of patient in prone.
3. Orthogonal planes: anatomy and ultrasound correlation.
4. Cautions during exam.
5. Initial evaluation and follow up.

SUMMARY

Teaching points:

- The Pavlik harness is a dynamic splint that allows a limited range of motion and keeps the hips partial flexed and abducted.
- The harness must keep the hip reduced intraarticular and the ultrasound is used to monitor the location and making corrections if necessary.
- US in decubitus prone is better than anteroposterior radiography for assessing hip position in pavlik harness.

Gastric Tube Check in the Pediatric Population: The Quick and Dirty of It

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CL-PDE4078

Booth Aldred , MD
Henry J Baskin , MD

PURPOSE/AIM

Fluoroscopic evaluation of percutaneous gastrostomy tubes (g-tubes) is a frequently-requested radiology exam in children. This exhibit demonstrates a checklist approach to performing and interpreting g-tubes studies as well as important complications the test can identify.

CONTENT ORGANIZATION

The presentation content will demonstrate the proper appearance and what to expect in a normal gastric tube check in a pediatric population. A following set of images will give examples of the abnormalities one might encounter. **Six commonly evaluated aspects:**

- Is the tube properly positioned within the stomach?
Is the balloon inflated?
Is there gastric outlet obstruction?
Is there gastroenteric fistula?
Is there extravasation of contrast?
Is there gastroesophageal reflux? **Each of the above diagnostic checklist items will be accompanied by an example of pathology:**

Dislodged g-tube.
Deflated balloon.
Gastric outlet obstruction by the balloon.
Iatrogenic gastrocolonic fistula.
Extravasation of contrast into the peritoneal cavity.
Previously undiagnosed gastroesophageal reflux.

SUMMARY

The evaluation of gastric tubes is a daily procedure in our pediatric practice. This exhibit identifies the appropriate appearance of a normal g-tube fluoroscopic study and important abnormalities that may be encountered during this examination.

Subependymal Cysts: Red Flags in Prenatal Detection on US and MRI

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CL-PDE4079

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Eleonore Blondiaux , MD
Chiara Sileo , MD
Marie-Laure Moutard
Antoinette Gelot
Jean-Marie Jouannic
Hubert A Ducou-Le-Pointe , MD
Catherine Garel , MD

PURPOSE/AIM

The purpose of this exhibit is:

1. To provide insights into morphological features and location of periventricular cysts that should raise suspicion for an underlying pathology.

2. To review the main indications for fetal brain MRI following detection of periventricular cysts.

CONTENT ORGANIZATION

The following data are described:

Prenatal parameters: obstetric complications, serological evidence of intrauterine infection and family history.

Spectrum of cysts features on US and MRI: size, height, number, morphology, location compared with the caudothalamic notch and with the ventricular horns.

Associated abnormalities: ventricular dilatation, fetal brain or body malformations, white matter abnormalities with MRI.

Postnatal imaging and neurodevelopmental outcome.

Postmortem data in case of termination of pregnancy.

Indications for fetal brain MRI.

SUMMARY

The major teaching points of this exhibit are: 1. Cysts facing the temporal or occipital horns, cysts located posterior to the caudothalamic notch and/or cysts associated with cerebral or extra-cerebral abnormalities are the main indications for fetal brain MRI. 2. Isolated cysts facing or located below the frontal horns and < 3 mm carry a good prognosis.

D'assessment of Vascular Rings Made Simple

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CL-PDE4080

Sharon W Gould , MD
Monica Epelman , MD
Michael McCulloch
Christian Pizarro
Cynthia K Rigsby , MD

PURPOSE/AIM

To review the types of vascular rings and describe a simple identification method utilizing readily recognizable anatomic findings. The utility of MRA and CTA techniques with reformatted images will also be discussed.

CONTENT ORGANIZATION

A brief overview of the embryology will be followed by discussion of imaging techniques. Cross-sectional imaging to characterize these abnormalities is based upon opacification of blood vessels completely surrounding the airway and esophagus, e.g.double aortic arches. However, this may not always be the case, as there may be atretic arch segments that do not opacify. In these instances, there are three extremely useful secondary signs beginning with the letter "D" that should raise suspicion for the presence of a vascular ring. These signs include diverticulum, dimple, and the descending aorta, all opposite the side of the arch. When these are present, the presence of a ductus /ligamentum arteriosum can be inferred indicating the presence of a vascular ring.

SUMMARY

Vascular rings are often not readily apparent by imaging when the ligamentum arteriosum or atretic portion of the aortic arch are not patent. Observers will learn from this exhibit that a Diverticulum of Kommerell indicates the presence of a ring, as do an aortic Dimple and a Descending aorta, both opposite the side of the arch.

Chronic Airway Obstruction in the Pediatric Population: A Guide for the General Radiologist

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CL-PDE4081

Madalsa Joshi , MD
Lila Yewchuk

PURPOSE/AIM

To review the common causes of chronic airway obstruction in the pediatric population. This includes abnormalities affecting the upper and lower airway. To provide key plain film findings that aid diagnosis and, in certain circumstances, prompt further investigation.

CONTENT ORGANIZATION

Review the definition and epidemiology of chronic airway obstruction. Briefly review normal upper and lower airway anatomy. Become familiar with its site specific differential diagnosis which includes congenital, inflammatory and neoplastic etiologies in the upper airway; bronchial foreign bodies, masses, tracheomalacia and vascular anomalies in the lower airway. Chronic lower airway obstruction will be further subdivided into intrinsic/extrinsic abnormalities. Focus on relevant plain film findings and, when appropriate, correlate with other imaging modalities. Present common, as well as uncommon, cases of interest.

SUMMARY

Chronic airway obstruction in the pediatric age group can be a diagnostic challenge for any radiologist. Being familiar with its site specific differential diagnosis and characteristic radiographic appearances is essential to help guide clinical management in a timely fashion. Knowing which imaging modality is most appropriate when further evaluation is required is an integral part of this process.

Palpable Chest Wall Mass in Children: Pictorial Essay

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CL-PDE4082

Yu Sung Yoon , MD
Hyo Weon Kim
Young Tong Kim

PURPOSE/AIM

1. To illustrate CT findings of the palpable chest wall masses in children.
2. To emphasize the role of MDCT for evaluation of palpable chest wall masses.

CONTENT ORGANIZATION

A wide variety of diseases manifest as a palpable chest wall masses in children. The diagnosis is difficult by physical examination, chest radiography or ultrasonography alone. However, MDCT with three dimensional reconstruction is useful in the characterization and differential diagnosis of palpable chest wall lesions.

- Normal variation, congenital anomalies

Tilted sternum, Prominent convexity of anterior rib or costal cartilage, Parachondral nodule, Asymmetric thoracic cavity, Pectus excavatum, Pectus carinatum, Focal lipomatosis

- Trauma

Sternal segmental dislocation

- Infectious disorders

Infected epidermal cyst, Chest wall abscess, BCG lymphadenitis, Acute axillary lymphadenitis

- Tumors

1. Soft tissue tumors Burkitt lymphoma, Plexiform neurofibroma, Infantile hemangioma, Lymphatic malformation, Lymphangiomatosis, Focal lipomatosis, Lipoblastoma, Rhabdomyosarcoma 2. Bone tumors

Pulmonary Blood Volume Imaging with Dual Energy Computed Tomography in Paediatric Patients with Congenital Heart Disease: State of the Art

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CL-PDE4083

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Marcel L Dijkshoorn , RT *
Ronald Booiij , RT
Adriaan Moelker , MD
Gabriel P Krestin , MD, PhD *
Mohamed Ouhlous , MD, PhD

PURPOSE/AIM

To describe imaging protocols, image reconstruction, post-processing and image analysis methods, and also pitfalls of Dual Energy Computed Tomography (DECT) in paediatric patients with congenital heart disease.

CONTENT ORGANIZATION

1. Scan protocol optimization:

- patient preparation
- imaging parameters
- contrast agent injection methods
- post-processing
- image analysis methods
- diagnostic pitfalls

2. Clinical cases:

- Show perfusion differences between left and right lung

SUMMARY

Dual Energy Computed Tomography (DECT) has emerged as a diagnostic tool to assess not only the anatomy of the pulmonary vessels but also to give quantitative information about the pulmonary blood volume (PBV). PBV-imaging is based on the quantification of the enhancement in tissue and blood at certain time points after intravenous administration of contrast media. The implementation of this technique in paediatric patients is still a field to be discovered. This exhibit will provide tips and examples in order to obtain consistent image quality and low dose imaging for paediatric population.

Langerhans Cell Histiocytosis in Children: Presenting Feature in Whole Body MR Image from the Point of View of Age-related Differences

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CL-PDE4084

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Jin Seong Lee , MD
Jae-Yeon Hwang , MD
Younghoon Cho
Hye-Kyung Yoon , MD
Chong Hyun Yoon

PURPOSE/AIM

To illustrate whole body MR (WBMR) imaging features of initial manifestations and patterns of recurrence of Langerhans cell histiocytosis (LCH) in children according to age. We will emphasize the differences in the pattern of LCH distribution between the age groups.

CONTENT ORGANIZATION

1. Introduction: Technical aspects, general roles and benefits of WBMR

2. LCH in children: general aspect of disease manifestation and course

3. Illustration of representative WBMR images of LCH in different age groups : Infant (0~1 year, 14 patients Young child (2~5 years, 12 patients child (6~10 years, 9 patients older child (11~15 years, 12 patients adolescence and young adult (16~25 years, 6 patient)

SUMMARY

Based on that WBMR is widely used that allow evaluation of multisystem disease in a single examination, 54 patients were initially evaluated by WBMR. Initial WBMR manifestations and recurrence pattern were reviewed. To the next step, according to age groups, we analyze the details at the aspect of involved site and patterns including osseous or extraosseous involvement. In the young children under 5 years old, there was tendency to involve multisystem more than older children. On this wise, WBMR is a useful tool for depicting multisystemic involvement without radiation hazard.

Classification of Vascular Anomalies: SE Mitchell's™s Flow Chart Combining Clinical and Imaging Decision Tree in Assessing Patients with Vascular Anomalies

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CL-PDE4085

Aylin Tekes , MD
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Kate Puttgen
Bernard Cohen
Richard Redett
Clifford R Weiss , MD *
Sally E Mitchell , MD

PURPOSE/AIM

To provide a visual clear way for physicians to evaluate patients with vascular anomalies: to guide classification into vascular tumors versus vascular malformations, then high flow versus low flow, and finally to proceed into classifying more complex syndromal vascular anomalies.

CONTENT ORGANIZATION

We are presenting vascular tumors including Infantile hemangioma (IH), rapidly involuting congenital hemangioma (RICH), noninvoluting congenital hemangioma (NICH), and Kaposiform hemangioendothelioma (KHE). Vascular malformations include venous malformation, lymphatic malformation, arteriovenous malformation, Parkes-Weber syndrome, and Klippel-Trenaunay Syndrome.

SUMMARY

Accurate classification of various vascular anomalies can be confusing for most physicians. This flow chart will clarify the differences between the various types of vascular tumors and vascular malformations based on history and clinical exam findings and, emphasize when to use imaging (ultrasound and MRI), and what to assess specifically for each entity. Clinical photos and corresponding imaging will help clarify the differences between each entity.

Best Itinerary for Use of Iterative Reconstruction (IR) Techniques in Pediatric CT: Sharing Lessons Learned across Different CT Platforms

CL-PDE4086

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Randheer Shailam , MD
Pallavi Sagar , MBBS
Katherine Nimkin , MD
Sjirk J Westra , MD

PURPOSE/AIM

- **(a)** To assess effect of IR techniques across different vendors specifically in *pediatric* CT settings,
- **(b)** To review the current literature for clinical studies in *pediatric* dose reduction, and
- **(c)** To Illustrate the use of different IR techniques and protocols in *pediatric* settings.

CONTENT ORGANIZATION

1. Review of different IR techniques in pediatric CT protocols including **adaptive statistical iterative reconstruction (ASiR)**, **VEO (model-based iterative reconstruction)**, **iterative reconstruction in image space (IRIS)**, **iDOSE** and **knowledge based iterative model reconstruction (IMR)**, **sinogram-affirmed iterative reconstruction (SAFIRE)**, and **Adaptive iterative reconstruction (AIDR 3D)**.
2. Diagnostic quality, noise and radiation dose implications with use of IR techniques in pediatric CT
3. Case based examples of IR techniques and protocols for different pediatric CT indications

SUMMARY

Iterative reconstruction techniques can help reduce radiation dose in pediatric CT. Although various IR techniques are currently in-use for pediatric CT, the image quality, noise and dose reduction potential varies across techniques, and scanners from different vendors. This exhibit will help learn the audience about pediatric IR techniques with their limitations across different vendors with examples.

Congenital Abnormalities of the Posterior Fossa: Anomalies beyond the Dandy-Walker Spectrum!

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Gunes Orman , MD
Thangamadhan Bosemani , MD, FRCR
Aylin Tekes , MD
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Andrea Poretti

PURPOSE/AIM

MRI has revolutionized the analysis and understanding of congenital brain anomalies over the past decades. The number of well defined congenital anomalies of the posterior fossa (CAPF) has steadily increased. However, there is still significant limited knowledge and confusion concerning CAPF. Many of them are erroneously classified as Dandy-Walker variant (DWV). We aim to review the neuroimaging findings and diagnostic criteria of the most frequent CAPF.

CONTENT ORGANIZATION

Typical neuroimaging findings of cerebellar and brain stem malformations (e.g. Dandy-Walker malformation, Joubert syndrome, rhombencephalosynapsis, pontocerebellar hypoplasias, pontine tegmental cap dysplasia and congenital muscular dystrophies) and cerebellar disruptions (e.g. unilateral cerebellar hypoplasia, cerebellar cleft and cerebellar disruptions in preterm neonates) are being presented.

SUMMARY

An accurate classification of CAPF and correct differentiation between malformative and disruptive lesions is important for prognosis and genetic counseling. Terms such as DWV lack specificity, are confusing and should be abandoned. If the diagnostic criteria of well-defined anomalies are not matched, a detailed anatomical description is preferable.

Red Flags in Fetal Imaging for Increased Risk of Genetic Disorders with Emphasis in Three-dimensional Fetal Reconstruction Using Obstetric Ultrasound and Magnetic Resonance Imaging

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Taisa D Gasparetto , MD
Heron Werner , MD
Pedro Daltro , MD
Lorena Arrieta
Maene Marcondes
Romeu C Domingues , MD

PURPOSE/AIM

This exhibit aims to illustrate and discuss the fetal imaging external abnormalities that may be associated with genetic disorders, emphasizing the 3D reconstruction of obstetric ultrasound (US) and magnetic resonance (MR) imaging, correlating such morphological alterations with postnatal findings.

CONTENT ORGANIZATION

Each heading below will be illustrated and discussed correlating the ultrasound and MR imaging findings: - Retrognathia - Tongue protrusion - Microftalmy and other ocular abnormalities - Cleft palate - Hypotelorism and hypertelorism - Low-set ears - Craniosinostosis - Proboscis - Club foot - Anomalies of the hand (polydactyly, syndactyly, ectrodactyly, clinodactyly , clenched hand) - Craniosynostosis

SUMMARY

- 3D imaging reconstruction is a useful technique that well demonstrates external fetal malformations helping in the treatment planning and parent counseling. - External abnormalities associated with genetic syndromes are often difficult to visualize in conventional US and MR images but can be well represented by three-dimensional reconstruction, especially if polidramnia is associated. - External findings are sometimes the only abnormalities in fetal imaging and the pediatric radiologist must be aware of this signs to properly interpret the cases.

Ciliopathies in Pediatrics: A Radioclinical Overview

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Kamaldine Oudjhane , MD, MSc
Zehour E Alsabban , MBBS

PURPOSE/AIM

1. To briefly review the biology, structure and function of the cilium , an ubiquitous cellular organelle. 2. To describe the classification of

ciliopathies. 2. To review the main clinical and imaging findings of such a heterogeneous group of disorders characterized by the basic defect in ciliary structure or function.

CONTENT ORGANIZATION

* Cilia structure and function * Classification of ciliopathies * Clinical spectrum of ciliopathies: a- Primary ciliary dyskinesia. b- Hepatorenal fibrocystic diseases (polycystic kidney disease, nephronophtosis). c- Craniofacial and skeletal syndromic ciliopathies (Bardet-Biedl, Joubert, Meckel-Gruber, oral-facial-digital type 1, Leber congenital amaurosis, Alstrom, McKusick-Kaufman, Ellis van Creveld , Jeune chondrodysplasia, Cranioectodermal dysplasia, short rib polydactyly), d- Heterotaxy syndromes.

SUMMARY

Ciliopathies is a recent concept of a category of diverse developmental and degenerative simple-gene disorders including primary ciliary dysplasia, hepatorenal fibrocystic diseases, craniofacial and skeletal syndromes, heterotaxy syndromes. Genetic heterogeneity, phenotypic overlap, clinical variability characterize these disorders. Imaging (such as sonography in cystic diseases, MRI in craniofacial syndromes, skeletal radiographs) plays a role in the detection and characterization of many phenotypic features.

Multi-modality Imaging in Paediatric Patients with Takayasu's Arteritis: What Is the Role of Functional Imaging Using FDG-PET CT?

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CL-PDE4090

Richard List , BMedSc, MBBS

Muthana Al-Obaidi

Daniel Hawley

Thuzar Win , MBBS, FRCR

PURPOSE/AIM

The aims are to:

- Correlate imaging findings with clinical presentation and pathophysiology of Takayasu's Arteritis
- Discuss the rationale for different imaging modalities in diagnosis and management of Takayasu's Arteritis in children
- Discuss when FDG PET-CT is appropriate in a child with Takayasu's Arteritis

CONTENT ORGANIZATION

Pathophysiology and Clinical Presentation of Takayasu's Arteritis in Children Imaging Findings in Children with Takayasu's Arteritis:

- Plain Radiography
- CT
- Ultrasound
- Echocardiography
- MRI
- FDG-PET CT

When is functional imaging justified? Summary

SUMMARY

The major teaching points of this exhibit are:

- Multi-modality anatomical imaging plays a key role in diagnosis and assessment of disease activity in Takayasu's Arteritis. Histopathological confirmation is rarely justified
- Anatomical imaging is limited in its assessment of disease activity: it can appear stable despite the patient remaining symptomatic on treatment.
- Functional imaging with FDG-PET-CT allows identification of areas of active disease despite normal inflammatory markers.
- Functional imaging can identify associated autoimmune inflammatory conditions
- FDG-PET-CT exposes the child to ionising radiation so its use should be limited to appropriate clinical scenarios

Imaging Findings in Fallopian Tube Disorders in Children and Adolescents with Illustrated Review of Normal and Pathological Anatomy

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CL-PDE4091

Mary P Harty , MD

Leslie E Grissom , MD

Katrina Conard , MD

PURPOSE/AIM

Purpose: 1. To demonstrate the variety of fallopian tube abnormalities found in children and adolescents 2. To learn the imaging features of these entities 3. To provide anatomic illustrations of normal anatomy and pathologic conditions in order to correlate imaging findings with the disease states

CONTENT ORGANIZATION

Between 2005 - 2013, reports with the word 'fallopian' were selected from the pathology database in our pediatric hospital. Cases of normal fallopian tubes and cases without imaging were excluded. Pathology included: acute and chronic salpingitis, fallopian tube cysts, fallopian tube torsion without ovarian torsion, hemorrhagic necrosis of the fallopian tube, isolated or with ovarian masses and fibrous obliteration of the fallopian tube. Pathologic findings were analyzed on CT, Ultrasound and MRI. Anatomic review with illustrations demonstrate normal anatomy of the fallopian tube, including vascular supply, innervation and lymphatic drainage. Pathologic illustrations include the torsed fallopian tube, cysts and hemorrhagic tube with inflammation.

SUMMARY

Major teaching points: 1. Reviewing anatomy improves understanding of the pathologic entities that can afflict the fallopian tube. 2. Familiarity with fallopian tube pathology can increase diagnostic accuracy in cases of pelvic pain in children and adolescents.

Rare Pediatric Orbit Tumors: Know Them and Don't Forget Their Radiological Appearance!

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CL-PDE4092

Mariana Sanchez Curiel Loyo , MD

Nora I Moguel , MD

PURPOSE/AIM

- Describe the radiological spectrum of rare orbital pediatric tumors.
- Determine clinical, radiological and histopathological agreement.
- Explain the utility of CT and MRI imaging in the diagnosis,
- Assist in the early treatment.

CONTENT ORGANIZATION

- Literature review of most frequent and rare pediatric orbit tumors
- Review of imaging findings within most rare orbit tumors in Mexican population by CT and MRI-
- Sample cases and differential diagnosis or mimics

- Summary

SUMMARY

The mayor teaching points of this review are:

- MRI is by far the best diagnostic tool but CT provides great information about the localization and extension.
- Proptosis is the most common clinical presentation
- Alveolar rhabdomyosarcoma, dermoid cyst, inflammatory pseudotumor and meningioma are among the most frequent.
- Very important to recognize others not so rare.

Imaging Findings of Pediatric Hydatid Disease. The Peruvian Experience!

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CL-PDE4093

Carlos F Ugas , MD
Edilberto D Villanueva , MD
Larry M Alpaca Rodriguez , MD

PURPOSE/AIM

To review the imaging spectrum of Pediatric Hydatid disease

CONTENT ORGANIZATION

Definition Epidemiology Imaging Findings Conclusion References

SUMMARY

Hydatid disease (HD) is a parasitic infection caused by *Echinococcus granulosus*. Peru is a highly endemic region, especially in cattle areas. Most hydatid cysts (HC) are acquired in childhood and are not diagnosed until adults, incidentally or when symptomatic. HD primarily affects the liver and secondary involvement due to hematogenous dissemination may be seen in almost any anatomic location. Classical imaging features when located in lung or liver and serologic findings can generally establish the diagnosis, but an HC in an unusual location with atypical imaging findings may complicate the differential diagnosis. Imaging findings range from purely cystic lesions to solid-appearing masses. Ringlike or total calcification can be seen during natural evolution as well as partial or complete detachment of the membranes and multivesicular cysts. This educational exhibit reviews the various imaging findings of HD in our pediatric population, most of them symptomatic. We based on the experience at the Instituto Nacional de Salud del Niño to get in use with atypical locations such as heart, mesentery, brain and others that may be helpful in making a prompt, accurate diagnosis.

Imaging Gynecologic Tumors in Children and Adolescence: Implications to Clinical Management

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CL-PDE4094

Tejaswini K Deshmukh , MD
Christine O Menias , MD
Ting Y Tao , MD, PhD
Premal Thaker
Elizabeth F Sheybani , MD
Marilyn J Siegel , MD *

PURPOSE/AIM

- To review imaging features of gynecologic tumors in children and adolescence
- To review the clinical implications and management of these tumors
- To discuss differential diagnosis and mimics

CONTENT ORGANIZATION

- Imaging spectrum of Gynecologic tumors seen in children and adolescents on Ultrasound, CT ,and MRI
- Embryonal rhabdomyosarcoma
- Dysgerminoma
- Endodermal sinus Tumor
- Non-gestational Choriocarcinoma
- Teratoma/ malignant teratoma
- Ovarian Leukemia/lymphoma
- Ovarian cystadenoma
- Juvenile granulosa cell tumor
- Gonadoblastoma
- Differential diagnosis and mimics including adnexal torsion, tubo-ovarian abscess, hemorrhagic cyst, hematocolpos and peritoneal inclusion cyst

SUMMARY

Gynecologic tumors in children and adolescents represent 1.5 to 2.0% of all malignancies, with ovarian tumors accounting for 95% . Non-epithelial tumors predominate, while carcinomas are rare but incidence rises with the age of girls. Although US is the initial exam of choice for evaluation of Gynecologic disorders in the child, MRI plays a valuable diagnostic tool, with CT used to stage disease. The spectrum of gynecologic tumors in childhood and adolescence and their imaging are reviewed. The prompt and precise detection of either benign or malignant tumors in children may lead to cure and preservation of fertility with conservative surgery.

Bilateral Abnormalities in Basal Ganglia and Thalamus in Childhood: Improvement of MRI in Assessment and Differential Diagnosis

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CL-PDE4095

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Antonio Muccillo , MD
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Rafael F Cabral , MD
Emerson L Gasparetto , MD
Romeu C Domingues , MD

PURPOSE/AIM

The basal ganglia are highly metabolically active and symmetrically affected by a wide variety of disease entities. This exhibit aims to describe the contribution of conventional and advanced MRI techniques in to improve the diagnose of lesions that involve basal ganglia and thalamus in childhood.

CONTENT ORGANIZATION

The radiologist will see lesions that can involve basal ganglia and thalamus, in acute and chronic situations, like carbon monoxide, methanol, and cyanide poisoning, liver disease, nonketotic hyperglycemia, hypoglycemia, hypoxic ischemic encephalopathy, leigh disease, and others. They will learn some features that can be seen in MRI, improving differential diagnosis, especially on basis of diffusion-weighted imaging, MR angiography, and MR spectroscopy.

SUMMARY

MRI is the modality of choice in evaluation of bilateral abnormalities of the basal ganglia and thalamus in childhood, helping better

Where Does that Tumor Come From? Embryological Bases of Hindbrain Masses

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CL-PDE4096

Roy Riascos , MD
Claudia Cotes , MD
Maddy Artunduaga , MD
Anjali Lal , MD
John C Heymann , MD
Reza Hakimelahi , MD
Leonard E Swischuk , MD

PURPOSE/AIM

Review the developmental anatomy of the posterior fossa with the aid of 3D diagrams.
Explain the posterior fossa masses according to their origin and development utilizing 3D diagrams.
Show the imaging findings that characterize the different posterior fossa masses.

CONTENT ORGANIZATION

Development and anatomy of the posterior fossa.
Cell lines -Tumors with neuroblastic or glioblastic elements
Medulloblastoma
Teratoid/Rhboid Tumor -Ependymal Lining
Ependimoma
Subependymoma -Vascular
Choroid Plexus Papilloma-Carcinoma
Hemangioblastoma -Glial Origin
Pilocytic astrocytoma
Brainstem Glioma -Ectodermal Inclusion cysts
Epidermoid
Dermoid
SUMMARY

The development of the posterior fossa is a complicated process that results in a complex anatomy with various cell types. We present a comprehensive way to understand the embryological lines that give origin to the different hindbrain masses. Understanding the development and anatomy of the posterior fossa is key in the differentiation of the masses that may arise and their typical imaging manifestations.

When Closure Fails: What the Radiologist Needs to Know about the Embryology, Anatomy and Prenatal Imaging of Ventral Body Wall Defects

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CL-PDE4097

Ulysses S Torres , MD
Fernanda D Braojos Braga , MD
Eduardo P De Oliveira
Heron Werner , MD
Pedro Daltro , MD
Antonio S Souza , MD

PURPOSE/AIM

The purposes of this education exhibit are: 1) To review the relevant embryology and anatomy of ventral body wall defects aiming to facilitate the diagnostic imaging approach. 2) Illustrate and discuss the main prenatal imaging features of these abnormalities.

CONTENT ORGANIZATION

This exhibit will use a case-based approach to demonstrate characteristic imaging findings in a range of ventral body wall defects. Representative cases will include omphaloceles, gastroschisis, pentalogy of Cantrell, bladder and cloacal exstrophy, and ectopia cordis.

SUMMARY

Prenatal imaging features of ventral body wall defects may be complex and challenging, often requiring from the radiologist a high level of suspicion and familiarity with the imaging patterns. Because a correct diagnosis has a pivotal role in the pregnancy management and treatment planning, radiologists should be able to recognize and distinguish between the abdominal wall defects and their associated anomalies.

From Embryology to MRI: Spectrum of Prenatal and Postnatal MRI Findings of Fetal Central Nervous System Malformations

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CL-PDE4098

Eduardo P De Oliveira
Ulysses S Torres , MD
Fernanda D Braojos Braga , MD
Jose Roberto L Ferraz-Filho
Antonio S Souza , MD
Beth M Kline-Fath , MD

PURPOSE/AIM

This education exhibit aims to: 1) Provide a concise overview of the normal development of the fetal CNS. 2) Categorize the fetal CNS malformations according to the developmental stages of their occurrence in order to facilitate the diagnostic approach by radiologists. 3) Illustrate and discuss the main prenatal MRI findings of these anomalies with postnatal correlation.

CONTENT ORGANIZATION

This exhibit will address the normal development of the fetal CNS, also reviewing the embryological classification of the fetal CNS malformations according the developmental stage of their occurrence. Finally, representative CNS malformations will be displayed in a case-based format, including examples of Chiari malformations, holoprosencephaly, septooptic dysplasia, encephaloceles, Dandy-Walker variant, hydranencephaly, anencephaly, schizencephaly, agyria-pachygyria, polymicrogyria, among others.

SUMMARY

Prenatal MR is a problem-solving tool after an abnormal US primary screening or in fetuses at increased risk to CNS malformations. Knowledge about the normal fetal neurodevelopment and its stages facilitates the classification and the diagnostic imaging approach of these anomalies. After reviewing this exhibit, radiologists should be able to recognize the prenatal and postnatal MRI features of the main CNS malformations as well as their embryological basis.

MRI and Spectroscopy Features of Metabolic Disorders Presenting in Neonatal Period

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CL-PDE4099

Ritu M Kakkar , MBBS

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Shrinivas B Desai , MD

PURPOSE/AIM

Emphasize characteristic MRI and spectroscopy features of metabolic disorders encountered in neonatal period, a series of 21 cases.

CONTENT ORGANIZATION

Maple syrup urine disease was the most common organic aciduria in our series, showing bilaterally symmetric restricted diffusion and hyperintensities in deep cerebellar white matter, dorsal brainstem, cerebral peduncles, posterior limbs of internal capsule (PLIC) and periorlandic white matter. On MR Spectroscopy (MRS) peak at 0.9 ppm representing branch chain amino acids was seen. Propionic academia presented with similar imaging findings and a glutamine/glutamate peak. Findings in non ketotic hyperglycinemia were hyperintensity in PLIC, midbrain and pons on both sides with glycine peak on MRS. Urea cycle defects showed diffuse cerebral edema with involvement of basal ganglia and glutamine peak. Patient with Zellwegers syndrome showed germinolytic cysts with polymicrogyria. Walker Warburg syndrome presented with gross hydrocephalus ,cobblestone lissencephaly and cerebellar cysts. 1 patient with molybdenum cofactor A deficiency showed restricted diffusion in deep grey matter and midbrain.

SUMMARY

MRI with MRS plays crucial role in early diagnosis of neonatal metabolic disorders, facilitating early treatment which often improves long term prognosis.

Volumetric Spin-echo MRI for Improved Surgical Roadmaps at Partial Nephrectomy in Children with Bilateral Nephroblastoma

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CL-PDE4100

Ranbir Sandhu , MBBS, MRCS
Oystein Olsen *

PURPOSE/AIM

About 5 percent of children with nephroblastoma (Wilms tumor) have synchronous bilateral disease. In these, partial nephrectomy may be the preferred surgical option to obviate (or postpone) dialysis. Volumetric spin-echo MRI with moderate effective echo-times is feasible using variable refocussing pulses, and may offer improved roadmaps at nephron-sparing surgery. We aim to demonstrate this in a pictorial review.

CONTENT ORGANIZATION

We will present volumetric MRI of renal tumors with various reconstructions that optimize the visualization of tumor-relation to the vessels and collecting system. This includes volumetric images co-registered with angiographic MR images. The presentation will emphasize the utility for the surgeon at partial nephrectomy. We will also present a reporting checklist.

SUMMARY

MRI, particularly with high-resolution volumetric imaging, offers excellent imaging for pre-operative evaluation of bilateral nephroblastoma including visualization of (1) small lesions, (2) tumor relations to the renal and retroperitoneal vasculature, (3) tumor relation to the pelvi-calyceal system.

Diagnostic Imaging In Postoperative Anorectal Malformation. When, What and How to Do It?

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CL-PDE4101

Angel Lancharro , MD
Alejandra Aguado , MD
Carlos Marin , MD
Yolanda Ruiz , MD
Isabel G Gordillo , MD

PURPOSE/AIM

To review the indications, diagnostic imaging method used , how to do it, and review and findings that can be found

CONTENT ORGANIZATION

During follow-up of patients with any type of anorectal malformation (ARM) repaired surgically, may appear functional failure clinic. The aim of radiological examination should focus on establishing the state of perineal anatomy, rulling out of postoperative complications; and establishing associated anomalies. To do this, we study the patient with MRI and/or US or dynamic studies and it depends on the primary clinic suspicius. On MRI, we used phased array antennas and mark the outer holes with auxine and the conduits with catheter filled with positive contrast ,saline or ultrasound gel . All sequences used are high-resolution and adding dynamic studies. In our series (96 cases reported since 2010) have high accuracy in detecting anomalies which are hypoplasia/atrophy of the sphincter, megasigma or spinal anomalies. They are less frequent occurrence of persistent fistula, mesorectal fat herniation or genital and detrusor abnormalities.

SUMMARY

The usefulness and challenges of diagnostic imaging studies in postoperative ARM patientes are presented. This exhibit will review:

- a. the indications
- b. the management of tecniches of study, especially MRI
- c. the spectrum of findings.

Fetal Magnetic Resonance Imaging of the Genitourinary Tract: A Pictorial Essay Illustrating Common Pathologies

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CL-PDE4102

Taisa D Gasparetto , MD
Heron Werner , MD
Teresa Victoria , MD, PhD
Tatiana M Fazecas , MD
Pedro Daltro , MD
Diego Jaramillo , MD, MPH

PURPOSE/AIM

Congenital genitourinary lesions are typically best assessed by ultrasound, with magnetic resonance (MR) imaging used as an adjunct in equivocal cases. The purpose of this exhibit is to illustrate the most common MR imaging findings in fetuses with genitourinary (GU) pathologies and to correlate these features with the sonographic findings and postnatal pathology/autopsy.

CONTENT ORGANIZATION

- MR imaging protocol and normal anatomy patterns - Abnormalities of the GU system: horseshoe kidney; renal agenesis; ectopic Kidneys; renal cystic diseases; multicystic dysplastic kidney; autosomal recessive polycystic kidney; isolated renal cyst; hydronephrosis; duplex kidneys; ureteropelvic junction obstruction; posterior urethral valves; anterior urethral stenosis in males; Prune-belly syndrome; cloacal malformation; megacystic microcolon intestinal hypoperistalsis syndrome.

SUMMARY

1. MRI protocols tailored to the specific GU abnormality and knowledge of the normal anatomy patters are key points when evaluating fetuses with GU pathologies 2. In addition to providing detailed soft tissue contrast, MRI adds physiologic information. The interplay of T1, T2 and DWI sequences add information about the characteristics of the abnormalities evaluated, making MRI particularly helpful when evaluating the fetus with GU abnormalities.

CL-PDE4103

Monica Rebollo , MD
Juan Dario Ortigoza Escobar
Jordi Muchart , MD
Mercedes Serrano Gimare
Belen Perez-Duenas , MD, PhD

PURPOSE/AIM

Thiamine transporter-2 (hTHTR2) deficiency is a recently described autosomal recessive disease due to mutations in the SLC19A3 gene with over 40 patients reported world-wide. Thiamine is an essential cofactor of mitochondrial enzymes involved in energy production. The aim of this exhibit is to illustrate the neuroimaging phenotypes and their differential diagnosis according to age.

CONTENT ORGANIZATION

1. Brief introduction to the thiamine metabolic pathways
2. Our Center's experience (3 cases) and comparison with the literature review: - Infantile lactic acidosis
 - Biotin-responsive basal ganglia disease
 - Wernicke like encephalopathy
3. Radiological criteria for the differential diagnosis with other causes of acute encephalopathy (hypoxia, mitochondrial encephalopathy, nutritional Wernicke, etc)

SUMMARY

hTHTR2 deficiency is in the differential diagnosis of acute encephalopathy in children. Radiological MRI criteria are crucial in the diagnostic approach:

- Symmetric lesions affecting the striatum and medial thalami and in areas of higher metabolic demands of the cerebral cortex (i.e. periorlandic cortex in the neonate)
- Infra-tentorial involvement (less common).
- Resolution of the lesions after thiamine supplementation Although is a rare condition, a correct diagnosis is important because of the therapeutic benefit of biotin and/or thiamine

3 Tesla MRI Patterns of Neonatal Brainstem Myelination**CL-PDE4104**

Domenico Tortora , MD
Valentina Panara , MD
Armando Tartaro , MD
Antonio R Cotroneo , MD
Massimo Caulo , MD, PhD

PURPOSE/AIM**CONTENT ORGANIZATION****SUMMARY****Do the Ultrasonographic Features of Superficial Soft Tissue Masses in Infancy Make You Scratch Your Head?: Hyperechogenicity Can Give a Helping Hand****CL-PDE4105**

Hyun Hae Cho
Young-Hun Choi
Jung-Eun Cheon , MD
Woo Sun Kim , MD
In-One Kim , MD

PURPOSE/AIM

The purpose of this exhibit is: 1. To review the list of hyperechoic superficial soft tissue masses in infancy. 2. To describe the clinical and imaging findings of these masses, including CT and MR findings.

CONTENT ORGANIZATION

1. Fat containing masses 1.1 Lipoma 1.2 Lipoblastoma 1.3 Fibrous hamartoma of infancy 1.4 Myxolipoma 2. Vascular lesions 2.1 Hemangioma, involuting stage 2.2 Venous malformation with organizing thrombi 3. Post traumatic or inflammatory lesions 3.1 Fat necrosis 3.1.1 Injection site granuloma 3.2 Hematoma 3.3 BCG lymphadenitis 4. Other benign masses 4.1 Pilomatrixoma 4.2 Diffuse neurofibroma

SUMMARY

Superficial soft-tissue masses in infancy are common referrals to pediatric radiologists in everyday clinical practice. In most cases, US is a first-line imaging modality. Even though, the sonographic features of many superficial soft-tissue lesions may be nonspecific, some US characteristics can help narrow the differential diagnosis. In this exhibit, we will present a list of diseases that can present as hyperechoic soft tissue lesions on US in infants and describe the imaging findings of these hyperechoic soft tissue masses, including CT and MR imaging. Knowledge of this differential diagnosis list can help make a more specific diagnosis of those lesions in infants.

MRI of The Fetal Heart: Illustration of the Normal and Abnormal Anatomy Comparing the Obstetric Ultrasonography and Fetal Magnetic Resonance Imaging Findings**CL-PDE4106**

Taisa D Gasparetto , MD
Heron Werner , MD
Pedro Daltro , MD
Flavia P Junqueira , MD, MSc
Thomas M Doring , MSc
Ralph Strecker *

PURPOSE/AIM

The second and third trimester routine US evaluation is the primary method to identify pregnancies at high risk for congenital heart disease. However, both US and echocardiography have some limitations as the operator-dependent condition, fetal position, maternal obesity, and oligohydramnios. In these cases, the MRI can be an adjunct technique for the assessment of the fetal anatomy. The purpose of this exhibit is to illustrate the fetal MRI findings of the normal and abnormal fetal heart comparing with the US images.

CONTENT ORGANIZATION

- o Technical advances in high speed and high resolution CINE imaging: Compressed Sensing
- o Normal fetal heart anatomy using the MRI and US views in an anatomic segmental approach: - Four chambers view - Three-vessel view - Pulmonary veins - Multiple planes images for the evaluation of heart position, size, axis, chambers, ventricular septum, moderator band. - Ventricular outflow tracts

SUMMARY

CL-PDE4107

Christine Jarlot
Sebastien Benali , MD
Francoise F Rypens , MD
Ramy El-Jalbout
Josee Dubois , MD

PURPOSE/AIM

The purpose of this exhibit is: 1. To review soft tissue vascular anomalies (VAs) in children, including vascular tumors and vascular malformations. 2. To describe characteristics on gray scale and Doppler ultrasonography (US) of various VAs of soft tissue. 3. To emphasize the validity of US in management of such lesions.

CONTENT ORGANIZATION

1. Classifications of VAs in children. 2. Current data imaging for diagnosis and evaluation of VAs. 3. Sonographic techniques using gray scale and Doppler US in assessment of VAs. 4. Description of different features on US examination that lead to suspicion of one of the VAs. 5. Sample cases and mimics.

SUMMARY

The major diagnosis clues are: 1. Infantile hemangiomas (IH): high vessels density with high peak arterial systolic Doppler shifts with low resistive index. 2. Rapidly involuting congenital hemangiomas (RICH): similar to IH, except calcifications can be seen. 3. Non-involuting congenital hemangiomas (NICH): similar to IH, but veins are more prominent and ectatic. 4. Compressibility of the lesions is helpful for the diagnosis of venous malformations. 5. Arteriovenous shunting can be seen in IH, NICH, RICH and obviously arteriovenous malformations. 6. Malignant tumors of soft tissues show a lower vascular density, ill defined margin and high resistive index.

Hand and Wrist: MR Imaging of Common and Uncommon Pediatric Disorders**CL-PDE4108**

Ramon Sanchez , MD
Maria Ladino Torres , MD
Indu Rekha Meesa , MD, MS

PURPOSE/AIM

The purpose of this exhibit is:

1. To review hand and wrist MR technique in pediatric population at our institution
2. To explain the utility and main indications to perform MR imaging of the pediatric hand and wrist
3. To describe MR imaging findings of common, uncommon and unique disorders of the pediatric hand and wrist

CONTENT ORGANIZATION

MRI technique
 Clinical indications
 Review of imaging findings
 Trauma
 Acute
 Occult osseous injury- fracture
 TFCC- ligamentous injury
 Non acute
 Chronic- stress injuries
 Sequela of SH injury
 Avascular necrosis
 Tumors Benign
 Malignant
 Pseudotumors
 Congenital anomalies
 Inflammatory conditions

SUMMARY

1. The hand and wrist are frequently injured during sport related activities in the pediatric population
2. MR imaging is an excellent modality for the evaluation pediatric traumatic and non- traumatic hand and wrist injuries and lesions
3. Familiarity with common injury patterns and disease processes unique to the pediatric population is necessary for optimal diagnostic accuracy of MR imaging of the pediatric hand and wrist

Portal Hypertension in Pediatric Age Group: Spectrum of Appearances on B-mode Ultrasound and Doppler with an Approach to Diagnose the Etiology**CL-PDE4109**

Yashant Aswani , MBBS
Lohith Ambadipudi , MBBS
Hemangini Thakkar , MD
Varun A Thakur
Sheetal Padalkar

PURPOSE/AIM

To describe B-mode ultrasound and doppler features in portal hypertension in pediatric population and to conclude 'how it differs' from that in adult population depending on the etiological factors.

CONTENT ORGANIZATION

Portal hypertension can affect any age group from a newborn to a geriatric with similar presenting features. The etiologies, however differ with age group. Different causative factors present different spectrum of b-mode and Doppler findings pointing towards a particular diagnosis.

For the purpose of description, the pediatric population is arbitrarily grouped into 0 -1year, 1-6 years and 6 years and above with different predominant etiologies of portal hypertension in each group and hence a characteristic ultrasound appearance.

SUMMARY

With no 'radiation risk', ultrasound becomes the imaging modality of choice for pediatric population. It plays significant role to diagnose pediatric portal hypertension and provides clues towards the etiology.

Review of Pediatric Congenital Heart Surgeries with 3D Imaging and Animation**CL-PDE4110**

Debkumar Sarkar , DO
David Lee
Preetam Gongidi , DO

PURPOSE/AIM

The purpose of this educational exhibit is to utilize 3D imaging and animations to pictorially provide a review of the cardiac surgical procedures and their characteristic imaging findings as well as to provide an overview of post operative complications and imaging surveillance.

CONTENT ORGANIZATION

A. Review of anatomy, pathology and imaging of various congenital cardiac anomalies. 1. ASD, VSD, PDA 2. Tetralogy of Fallot 3. Hypoplastic Left Heart Syndrome 4. Truncus Arteriosus 5. Transposition of the great vessels 6. Total anomalous pulmonary venous return 7. Coarctation of the aorta B. Surgical Procedures 1. Blalock Taussig Shunt 2. Sano Shunt 3. Norwood Procedure 4. Fontan Procedure - Bidirectional Glen/Hemifontan - Fontal completion 5. PDA ligation 6. Coarctation repair C. Review of postoperative imaging findings D. Post surgical complications E. Imaging surveillance F. Outcomes

SUMMARY

This educational exhibit provides an image rich review of the various cardiac surgeries utilized to correct congenital cardiac anomalies utilizing 3D images and animations to demonstrate the procedures while providing post-surgical imaging findings, complications, outcomes and guidelines for imaging surveillance.

Donâ€™t Shoot from the Hip: Usual and Unusual Causes of Hip Pain in Children

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CL-PDE4111

Khaldoun Koujok , MD
Nishard Abdeen , MD
Julie Hurteau , MD

PURPOSE/AIM

To illustrate the wide variety of articular and extra-articular causes of hip pain in children, and to **present an imaging algorithm to identify unusual causes of hip pain** which may be missed on routine examinations.

CONTENT ORGANIZATION

Non-traumatic hip pain can be caused by a myriad of conditions, some of which may lead to severe disability if diagnosed late.

Radiography is the front line study. We illustrate the radiographic appearance of classic pediatric hip pathologies including

Legg-Calve-Perthe's disease, SCFE, osteomyelitis, and benign and malignant tumors.

Ultrasound is often the second study when the hip pain is associated with fever. If there is no hip effusion, the ultrasound exam should be extended to exclude unusual causes of pain such as thrombophlebitis, appendicitis, and pelvic tumors.

A negative extended US in a child with fever and hip pain should prompt an MRI of the pelvis. MRI examples of focal pyomyositis, soft tissue abscess, early avascular necrosis, pre-slip of femoral epiphysis, and pelvic muscle tears will be shown.

SUMMARY

1. Hip pain in children has a wide range of causes, some of which will lead to severe disability if diagnosed late.
2. A diagnostic algorithm comprising radiography, hip ultrasound, and MRI of the pelvis will minimize the risk of missing extraarticular pathology.

Spinal Dysraphisms: Top Ten Things a Neurosurgeon wants to Read in MRI Report

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CL-PDE4112

Poonam Narang
Vasanthakumar Venugopal , MD
Nishith Kumar , MD
Ajay Sharma
Krishna C Joshi
Manish Gupta , MD

PURPOSE/AIM

- 1.To review imaging aspects of spinal dysraphisms from modern perspective
- 2.To discuss the top ten findings that are to be included in a MRI report

CONTENT ORGANIZATION

- Ten things to report and their implications for neurosurgeon (in descending order of importance) 10.Vertebrae body abnormalities 9.

Associated Congenital anomalies(VACTERL spectrum) 8. Bladder involvement 7. Lipoma-placode interface inside or outside the spinal canal-

implications for CUSA 6. Diastometamelia - level,extent and type 5.Presence or absence of tonsillar herniation 4.Presence or absence of

Hydrocephalus 3. Level and morphology of spinal cord 2. Level and extent of Dysraphism 1. Content of sac- pure

meningocele,meninomyelocele, myelocele or lipomyelocele

SUMMARY

The major teaching points 1. In the presence of hydrocephalus or tonsillar herniation, CSF diversion procedures should precede surgical correction to avoid brain stem compression and respiratory arrest during surgery 2. Surgical approaches for bony and fibrous septum differ

3. VACTERL defects have implications for anaesthetic procedures 4. Preoperative bladder assessment has medicolegal implications 5.

Location of lipoma placode interface outside the spinal canal precludes use of Cavitron USG aspirator

Pre-Wallerian Degeneration in Neonates Presenting with Acute Infarct: The 3 Tesla Magnetic Resonance Imaging (3T MRI) Experience

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CL-PDE4113

Adrienne F Thompson , MD
Yonker Y Wang , MD

PURPOSE/AIM

Pre-wallerian degeneration (PWD) is a critical finding in patients with infarct, as it has significant prognostic implications. This case-based presentation highlights the benefits of 3T MRI in detecting PWD in neonates with acute ischemic infarct.

CONTENT ORGANIZATION

The benefits and drawbacks of 3T MRI neonatal brain imaging are presented. PWD will then be defined, its imaging features described, and prognostic implications discussed. A number of cases of neonates presenting with acute infarct and showing pre-Wallerian degeneration on 3T MRI will then be presented. The timeline of the imaging findings related to presentation will be laid out, in order to highlight the potential of earlier detection of PWD using 3T MRI.

SUMMARY

Discovering PWD on MR imaging is key to determining the prognosis of infants presenting with ischemic infarct. Though 1.5T MRI has been shown to be effective in detecting PWD, its longer acquisition time predisposes the study to motion artefact, necessitating neonatal sedation for the study. Our experience shows that MR imaging at 3T is similarly effective in detecting the critical result of neonatal PWD in patients presenting with acute arterial ischemic infarct, while not using any sedation. Therefore, in an effort to minimize the risk to neonates undergoing MR imaging, we favor the use of 3T MRI when available.

MR Imaging of the Cerebellum in Children

CL-PDE4636

Erin W Kinney , MD
Sumit Pruthi , MBBS

PURPOSE/AIM

The cerebellum is a complex structure coordinating fine motor function via extensive connections with the brainstem and spinal cord. Understanding its intricate anatomy and function is crucial for accurate interpretation of the many pathologic processes affecting the cerebellum in children. This exhibit will review the anatomy and pathology of the cerebellum, including congenital, neoplastic, traumatic, infectious and toxic/metabolic diseases.

CONTENT ORGANIZATION

1. Review cerebellar anatomy on clinical and 7-Tesla MRI scanners, with focus on the function of the deep nuclei and cerebellar peduncles. 2. Briefly review cerebellar embryology and development and their significance in the genesis of pathology. 3. Discuss congenital abnormalities of the cerebellum, emphasizing the role of fetal MRI and advanced neuroimaging techniques including Diffusion Tensor Imaging (DTI). 4. Review clinical and imaging characteristics of neoplastic, traumatic, infectious and toxic/metabolic processes commonly affecting the cerebellum in children.

SUMMARY

Diagnosis of abnormalities within the cerebellum can be difficult due to its complex structure and diverse pathology. By understanding the function and interactions of various structures and common disease states, radiologists can provide added value and improve care provided to affected children.

Pediatric Case of the Day[Back to Top](#)**LL-EDE3012****Moderator**

Lynn A Fordham , MD
W. Dean Bidgood , MD, MS
Tae Il Han
Cassandra M Sams , MD

PURPOSE/AIM

1) Challenge yourself with unknown pediatric cases. 2) Review test cases and similar cases. 3) Increase depth of knowledge in Pediatric imaging.

Pediatric Case of the Day[Back to Top](#)**LL-EDE3012****Moderator**

Lynn A Fordham , MD
W. Dean Bidgood , MD, MS
Tae Il Han
Cassandra M Sams , MD

PURPOSE/AIM

1) Challenge yourself with unknown pediatric cases. 2) Review test cases and similar cases. 3) Increase depth of knowledge in Pediatric imaging.

Pediatric Case of the Day[Back to Top](#)**LL-EDE3012****Moderator**

Lynn A Fordham , MD
W. Dean Bidgood , MD, MS
Tae Il Han
Cassandra M Sams , MD

PURPOSE/AIM

1) Challenge yourself with unknown pediatric cases. 2) Review test cases and similar cases. 3) Increase depth of knowledge in Pediatric imaging.

Pediatric Case of the Day[Back to Top](#)**LL-EDE3012****Moderator**

Lynn A Fordham , MD
W. Dean Bidgood , MD, MS
Tae Il Han
Cassandra M Sams , MD

PURPOSE/AIM

1) Challenge yourself with unknown pediatric cases. 2) Review test cases and similar cases. 3) Increase depth of knowledge in Pediatric imaging.

Pediatric Radiology Series: Pediatric Neuroimaging I

Sunday, 10:30 AM - 12:00 PM • S100AB

PD MR NR

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VSPD11 • AMA PRA Category 1 Credit™:3.75 • ARRT Category A+ Credit:4

Moderator

Marvin D Nelson , MD
Sanjay P Prabhu , MBBS

VSPD11-01 • MR Imaging of the Neonatal Brain

Marvin D Nelson MD (Presenter)

LEARNING OBJECTIVES

1) To review the common adversities and reactions to such in the fetal and neonatal brain. 2) To demonstrate the use of various imaging techniques for assessing acquired fetal and neonatal brain lesions. 3) To highlight the importance of the placenta on normal brain development.

VSPD11-02 • Impaired Preoperative Global and Regional Cerebral Perfusion in Newborns with Complex Congenital Heart Disease

Usha D Nagaraj MD (Presenter) ; Iordanis Evangelou DPhil ; Mary Donofrio ; Gilbert Vezina MD ; Catherine Limperopoulos PhD

PURPOSE

To compare global and regional cerebral perfusion in neonates with congenital heart disease (CHD) versus healthy controls using arterial spin labelling (ASL) MRI.

METHOD AND MATERIALS

ASL is a non-invasive technique for evaluating cerebral perfusion without the use of an exogenous contrast agent. We performed brain MRIs in 73 newborns (30 with complex CHD, 43 controls) prior to open heart surgery on a 3T scanner. 3D FSE Pseudo-continuous ASL sequence was utilized. Post-acquisition image processing was undertaken on a Linux workstation using FSL software. All cases were reviewed by a board certified radiologist (UN) who was blinded to clinical parameters and case/control status. Mean whole brain cerebral blood flow (CBF) was calculated using the scanner software and recorded in mL/100g/min. CBF ASL images were linearly co-registered to the axial T2 images for anatomic delineation and selection of regions of interest to further evaluate regional blood flow using ITK-SNAP software. Areas studied included the frontal white matter, posterior white matter, thalami and basal ganglia.

RESULTS

Mean gestational age at MRI of the neonates studied was 40.9 weeks. Mean birth weight in reported neonates was 3174 grams. Affected newborns represented a variety of CHD diagnoses including hypoplastic left heart syndrome, tetralogy of Fallot, transposition of the great vessels, and ventricular septal defects. Average whole brain CBF in the controls (20.1 +/-4.6 mL/100g/min,) was significantly higher than in the newborns with CHD (17.4 +/- 4.1 mL/100g/min, p=0.01). Average regional perfusion in the occipital white matter of the controls (13.9 +/- 5.1 mL/100g/min) was also significantly higher than in the patients with CHD (11.3 +/- 3.8 mL/100g/min, p=0.02). Regional CBF in the frontal white matter, thalamus and basal ganglia did not demonstrate a statistically significant difference between the controls and CHD newborns.

CONCLUSION

ASL MRI demonstrates differences in cerebral perfusion between newborns with CHD versus normal healthy controls. Our data suggests that newborns with CHD may have decreased whole brain perfusion and a regional vulnerability in the occipital white matter prior to open heart surgery.

CLINICAL RELEVANCE/APPLICATION

ASL MRI is a promising non-invasive tool for evaluating changes in cerebral perfusion resulting from abnormal hemodynamics in neonates with complex congenital heart disease.

VSPD11-03 • Abnormal Glutamatergic Metabolism during Cooling Correlates with Poor Outcome in Neonates Undergoing Hypothermia Therapy

Jessica L Wisnowski PhD (Presenter) ; Tai-Wei Wu ; Ida Ashoori ; Marvin D Nelson MD ; Istvan Seri MD, PhD * ; Ashok Panigrahy MD ; Stefan Bluml PhD

PURPOSE

To study glutamatergic metabolism in neonates undergoing hypothermia therapy (HT) for suspected hypoxic-ischemic injury (HII)

METHOD AND MATERIALS

RESULTS

Neonates with poor outcome had lower creatine (? 24%), N-acetyl-aspartate (? 27%) and myo-inositol (? 11%) and higher lactate (Lac; ? 285%) and glutamine (Gln; ? 184%) during HT (see Figure). Glutamate (Glu) concentration during HT did not distinguish outcome groups; however, after HT, Glu was lower in neonates with poor outcome. Finally, as predicted from models, Glu concentration was lower (? 20%) during HT compared to after.

CONCLUSION

HII affects 3-5/1000 neonates and nearly half face death or severe disability despite therapy. Glutamate excitotoxicity in the setting of energy failure is widely hypothesized to be a key mechanism of cell death following HII. We found elevated glutamine in the neonates with poor outcome, and it is possible that this is indicative of excitotoxic injury as well as some ongoing capacity for astrocytes to detoxify excessive glutamate, albeit ultimately at a level insufficient to prevent poor outcome. However, it is important to consider that glutamine is not only synthesized from glutamate in astrocytes, but also that glutamine can be used as an energy metabolite. More research is needed to map the metabolic fate of glutamate and glutamine in neonates with HII.

CLINICAL RELEVANCE/APPLICATION

MR examinations during HT may not only aid clinical management but also the development of adjuvant therapies that aim to alleviate glutamate excitotoxicity.

VSPD11-04 • Longitudinal Changes in Diffusion Properties in White Matter Pathways in Patients with Tuberous Sclerosis Complex

Jae W Song MD, MS (Presenter) ; Fiona Baumer MD ; Paul D Mitchell MS ; Rudolph Pienaar PhD ; Mustafa Sahin MD, PhD ; Ellen Grant MD ; Emi Takahashi PhD

PURPOSE

The purpose of this study was to identify predictors of longitudinal changes in diffusion properties of white matter tracts of projection, association and commissural fibers in patients diagnosed with Tuberous Sclerosis Complex.

METHOD AND MATERIALS

Structural and diffusion magnetic resonance imaging was carried out in 17 subjects diagnosed with Tuberous Sclerosis Complex (TSC) (mean age, 7.2 ± 4.4 years, range: 2 - 17.5 years) and with at least 2 scans (mean number of days between the 2 scans 419.4 days ± 105.4 days, range: 309 - 741 days). There were 10 males and 7 females; 5 of whom had autism spectrum disorder (ASD); and 10 of whom had seizure disorder. A coordinate-based tractography atlas was used to guide ROI placement to delineate the internal capsule/corona radiata, cingulum, and corpus callosum. These ROIs were then co-registered using FLIRT to each subject's second scan. The outcomes were mean change in apparent diffusion coefficient (ADC) and the mean change in fractional anisotropy (FA).

RESULTS

Multiple linear regression analyses showed gender to be a significant predictor of mean change in ADC in TSC subjects in the left internal capsule, right and left cingulum, and corpus callosum, adjusting for initial ADC scan measures. Gender was only a significant predictor of mean change in FA in the corpus callosum. Adjusting for initial ADC or FA scan measures, seizure disorder also emerged as a significant predictor of mean change in ADC, but not for mean change in FA, in the left internal capsule. ASD did not emerge as a significant predictor in either the mean change in ADC or FA in the studied white matter tract pathways.

CONCLUSION

Gender and seizure disorder were independent predictors of mean change in ADC or FA in some white matter tract pathways in TSC subjects. White matter microstructural integrity was more affected in males than in females in the left internal capsule, right and left cingulum, and corpus callosum and more affected in TSC subjects with seizure disorder in the left internal capsule than in subjects without seizure disorder.

CLINICAL RELEVANCE/APPLICATION

Effects of new therapies for TSC are being evaluated by changes seen on neuroimaging. Thus, understanding how specific patient characteristics differentially affects neuroimaging in TSC is recommended.

VSPD11-05 • Posterior Fossa Morphometry and Volumetric Analysis in Three Different Groups of Pediatric Patients: Congenital Chiari Type 1 Malformation, Posterior Craniosynostosis and Costello Syndrome

Rosalinda Calandrelli ; Gabriella D'Apolito MD (Presenter) ; Mariavalentina Tumino ; Luigi M Pedone MD ; Simona Gaudino MD ; Cesare Colosimo MD

PURPOSE

Cerebellar tonsils herniation is caused by heterogeneous group of disorders with different pathogenic origins and it may occur early or late in childhood. In order to better evaluate the mechanism of herniation we performed a morphometric and volumetric analysis of the posterior cranial fossa in three different groups of pediatric patients in which cerebellar tonsil herniation occurs: children with congenital Chiari I malformation, children with posterior craniosynostosis and children with Costello Syndrome.

METHOD AND MATERIALS

Volumes of the posterior cranial fossa (PCFV) and cerebellum (CV) were assessed on axial T2-weighted MR images in 26 children with congenital Chiari I malformation (average 60 + 24 months), 6 children with Costello Syndrome (average 32+ 22 months) and 10 children with posterior craniosynostosis (average 12+ 11 months). The ratio of PCFV and CV was calculated to obtain the proportion of the PCFV occupied by the CV and to reduce the variability among the different groups. Each group was compared with an age matched control group. Volumetric measurements were correlated with diameter of the foramen magnum, tentorial angle, supraocciput and basiocciput lengths.

RESULTS

In children with congenital Chiari type I malformation, PCFV/CV ratio, antero-posterior diameter of the foramen magnum, supraocciput and basiocciput lengths were found significantly reduced (p In children with Costello Syndrome, PCFV/CV ratio, PCFV, antero-posterior and latero-lateral diameters of the foramen magnum and basiocciput length were found significantly reduced, while tentorial angle was found significantly increased (p In children with posterior craniosynostosis, PCFV, CV, latero-lateral diameter of the foramen magnum, supraocciput and basiocciput lengths were found significantly reduced (p

CONCLUSION

Our findings support the theory that reduction of PCFV plays an important role in developing cerebellar tonsillar herniation but other factors like foramen magnum diameters, supraocciput and basiocciput lengths and tentorial angle, contribute to explain the mechanism of cerebellar tonsils herniation.

CLINICAL RELEVANCE/APPLICATION

Morphometry and volumetric analysis of the posterior fossa are helpful to understand cerebellar tonsillar herniation mechanism guiding clinical or surgical approach.

VSPD11-06 • MRI Findings of Hypertrophic Olivary Degeneration after Surgery for Posterior Fossa Tumors in Children

Tommaso Tartaglione MD (Presenter) ; Annibale Botto ; Andrea M Alexandre MD ; Giana Izzo MD ; Mariacarmela Sciandra MD ; Simona Gaudino MD ; Cesare Colosimo MD

PURPOSE

Hypertrophic olivary degeneration (HOD) is a possible consequence of injuries along dento-rubro-olivary pathway. The purpose of our study was: 1) To evaluate the incidence of HOD after surgery for posterior fossa pediatric tumors. 2) To show the typical MRI findings of HOD. 3) To analyze time correlation between surgery and MRI evidence of HOD.

METHOD AND MATERIALS

We based our study on a retrospective evaluation of 57 patients surgically treated for posterior fossa tumors in our institution between 2007 and 2012. For each patient Magnetic Resonance (MR) examination was performed before surgery. Every patient underwent clinical and radiological follow-up by serial MR examinations with variable time interval from surgery date (from 1 week to 5 years). All examinations included conventional MRI sequences before and after gadolinium injection and DWI images. For each exam we evaluated: 1) signal intensity of inferior olivary nucleus (ION) 2) dimensions of ION (normal, enlarged, atrophic) 3) signal intensity along the dento-rubro-olivary pathway (red nucleus, dentate nucleus, central tegmental tract, inferior and superior cerebellar peduncles) that could explain HOD. 4) evidence of haemorrhagic lesions. Findings were correlate with time interval between surgery and MR examination

RESULTS

HOD was diagnosed in 18/57 patients (31 %). In all the 18 patients, MRI showed high signal intensity on T2w images in ION and lesions in dentate nuclei (mono- or bilaterally), with subsequent contralateral or bilateral HOD. Enlargement of ION (hypertrophy) was found in only 3/18 cases, with variable time delay from surgery (from 1 to 5 months). In 2 cases of bilateral HOD we observed hyperintensity on T2w images in both superior cerebellar peduncles. DWI and contrast enhanced T1w images did not show alterations of ION.

CONCLUSION

1) Hyperintensity on T2w MRI images in the ION was the most common finding in HOD, and was often associated to lesions in contralateral dentate nucleus. 2) Enlargement of ION was not always present and time interval between surgery and its MRI evidence was variable. 3) The low incidence of ION enlargement could be related to the absence of hemorrhagic lesions in our population

CLINICAL RELEVANCE/APPLICATION

MRI changes in HOD were frequently assessed after posterior fossa surgery for pediatric tumors.

VSPD11-07 • MRI of Pediatric White Matter Disease

Sanjay P Prabhu MBBS (Presenter)

LEARNING OBJECTIVES

1) To become familiar with the spectrum of white matter disease in children including demyelination, dysmyelination and neurometabolic disorders. 2) To provide a step-wise algorithm for approaching imaging studies with white matter abnormality and use a pattern-recognition approach to narrow the differential diagnosis. 3) To illustrate examples of conditions with characteristic imaging findings and elaborate use of advanced imaging techniques in refining the diagnosis.

ABSTRACT

Oncodiagnosis Panel: Pediatric Sarcoma (An Interactive Session)

Sunday, 10:45 AM - 12:15 PM • E353C

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SPOI11 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Nina A Mayr, MD

Moderator

John Breneman, MD

Gregory S Stacy, MD *

Lynn Million, MD

Raffi S Avedian, MD

LEARNING OBJECTIVES

1) Understand the principles of musculo-skeletal imaging as it relates to soft tissue tumors arising in the extremity and trunk. Specifically, the learner will understand the importance of how appropriate imaging modalities are critical to correct diagnosis, staging and treatment of soft tissue tumors in children. 2) Apply basic physics principles to the imaging and therapeutic modalities involved in diagnosis, staging and management of soft tissue sarcomas in children. Specifically, the learner will be able to apply specific imaging modalities and techniques in order to improve the detection, accuracy of staging and management of soft tissue sarcomas, while minimizing the risk of ionizing radiation exposure in children. 3) Analyze the value of different imaging modalities and therapeutic techniques for children with soft tissue sarcomas. Specifically, the learner will be able to analyze the importance of specific imaging studies required for patient enrollment in clinical trials and ensure safe administration of cancer therapy with respect to cost. 4) Demonstrate how cultural and economic differences may influence practices of care for radiologic imaging in children with soft tissue sarcomas today and the future. 5) Compare relative value of image guided techniques in management of pediatric soft tissue sarcomas. Specifically, the learner will be able to compare the pros and cons of current image guided techniques for the diagnosis and management of soft tissue sarcomas in children to optimize outcome and minimize complications.

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

Sunday, 12:30 PM - 01:00 PM • S101AB

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[PD]

CL-PDS-SUA • AMA PRA Category 1 Credit™:0.5

Host

Sanjay P Prabhu, MBBS

CL-PDS-SU1A • Core vs. Complete MRI Protocols for Diagnostic Assessment of Temporomandibular Joints (TMJ) in Juvenile Idiopathic Arthritis (JIA). Is There a Diagnostic Interpretation Difference at 1.5 and 3T?

Emilio Inarejos Clemente MD (Presenter) ; **Jennifer Stimec** MD ; **Nikolay Tzaribachev** ; **Bernd Koos** ; **Lynn Spiegel** MD ; **Andrea S Doria** MD *

PURPOSE

To evaluate the inter-reader reliability for interpretation of TMJ exams utilizing a core vs complete MRI protocol, and to assess readers' capability for visualization of anatomic structures using core vs complete protocols at 1.5 and 3T.

METHOD AND MATERIALS

MRI exams of 25 JIA patients (20 F/5 M; age range,8-17 years; mean,13.7 years) were acquired on a 1.5T Philips Systems scanner and of 23 JIA patients (18 F/5 M; age range,7.7-17 years; mean,13.2 years) on a 3T Philips Systems scanner. All MRI exams were independently scored by 3 blinded readers (scores 0-3, normal-severe) with regard to specific items (synovitis [0-3, none-severe]/synovial thickness [mm], extension[0-3]/ bone erosions depth [mm]) using a core (3 planes T1 fat saturated [FS] post-gadolinium [Gd]) and an expanded (coronal T1, sagittal T2FS, sagittal PD, 3 planes T1FSGd) protocol. Readers scored individual MRI sequences according to the capability of visualization of anatomic structures (scores 0-5, 0=not visible, 5=excellent visibility).

RESULTS

Total scan time for core/expanded MRI protocols at 1.5 and 3T were 13.86 / 27.36 min and 12.39 / 20.41 min, respectively. Inter-reader agreement for semi-quantitative scores was poor to moderate for synovitis both at 1.5T (intraclass correlation coefficient [ICC], 0.37-0.46) and 3T (0.48-0.62), which improved for quantitative measurements: variable/substantial ICCs for synovial thickness (variable ICCs at 1.5T and 0.80-0.82 at 3T) and variable/substantial for bone erosion depth (ICC, 0.37-0.76 at 1.5T and 0.79-0.84 at 3T). The reader's capability for visualization of anatomic structures was not different between core and complete protocols for synovitis at 1.5T (mean, SD, 3.96 [0.87] and 3.87 [0.54], P>0.05); or at 3T (4.39 [0.71] and 4.13 [0.81], P>0.05), or for bone erosions extent at 1.5T (3.16 [1.01] and 2.96 [1.05], P>0.05) or at 3T (4.17 [0.93] and 4.13 [0.86], P>0.05).

CONCLUSION

Regardless of the MRI strength field further improvement of semi-quantitative assessment of JIA TMJs is required. Optimization of MRI protocols towards decreasing scanning times does not significantly affect the capability of readers for interpretation of basic findings in TMJs of JIA patients which do not require pre- and post-contrast assessment, either at 1.5 or 3T.

CLINICAL RELEVANCE/APPLICATION

A faster MRI protocol for TMJ in JIA can obtain diagnostic information for specific clinical questions regardless the strength of the magnet.

CL-PDS-SU2A • Changes in the Amplitude of Low-frequency Fluctuations and Its Correlation with Children Suffered from Irritable Bowel Syndrome: A Resting-state fMRI Study

Na Chang (Presenter) ; **Na Liu** MD ; **Bing Yu** MD ; **Qiyong Guo** MD

PURPOSE

To measure the changes of amplitude of low-frequency fluctuations (ALFF) using resting-state functional magnetic resonance imaging (R-fMRI) in children with irritable bowel syndrome(IBS).

METHOD AND MATERIALS

Thirty IBS children(15 female;age8±2.1y) and thirty controls(15 female;age8±1.2y) were recruited. The functional MRI was performed at resting state on a 3.0T MR scanner. The resting-state fMRI data of patients diagnosed with IBS and healthy children were obtained and performed ALFF analysis. The ALFF data of IBS and controls were analyzed by student's t test. A P value of less than 0.05 was considered to indicate statistical significance.

RESULTS

Compared with normal controls, ALFF values was increased significantly in bilateral medial prefrontal cortex (MPFC), bilateral thalamus and right insula in IBS children(p

CONCLUSION

The functional changes in bilateral MPFC, bilateral thalamus and right insula might be associated with children with IBS.

CLINICAL RELEVANCE/APPLICATION

The functional changes in MPFC, thalamus and insula might be associated with children with IBS.

CL-PDS-SU3A • Apparent Diffusion Coefficient (ADC) In Characterization of Posterior Fossa Tumors in Children-Egyptian Experience

Mohamed A Aggag MD (Presenter) ; Amal M Refaat MD ; Ayda A Youssef MSc, PhD

PURPOSE

This study aims to assess the correlation between the apparent diffusion coefficient (ADC) and the type of posterior fossa tumors in children.

METHOD AND MATERIALS

Retrospective review of patient charts with histologically proved neoplasm in the CCHE database from Jan 2008 till Dec 2011 was performed. The preoperative Diffusion Weighted Imaging (DWI) and ADC characteristics of posterior fossa tumors in 104 children (38 Female, 66 Male; Age range 6 months - 15 years, median: 6.4 years) were compared with post-operative histopathology diagnosis. Kruskal-Wallis test was performed to measure the difference in the ADC between different histological sub-diagnoses. Post Hoc method was used to test the significant difference between each two sub-diagnoses. Statistical analyses were performed using SPSS.

RESULTS

There was a significant difference between ADC in different histological subgroups (p 0.05).

CONCLUSION

In our sample, ADC is useful for differentiation between different posterior fossa tumors at paediatric age, when used to compare different common histology. These results are expected to be of great impact on preoperative evaluation of brain tumors.

CLINICAL RELEVANCE/APPLICATION

Correlation between the apparent diffusion coefficients (ADC) calculated from DW images and tumor cellularity shows growing confidence in tumor tissue characterization. Correlation between the apparen

CL-PDS-SU4A • On the Etiology of the Cam Deformity in Femoroacetabular Impingement: A Cross-sectional Paediatric MRI Study

Sasha Carsen MD (Presenter) ; Kawan S Rakhra MD ; Paul Moroz MD ; Hal J Dunlap MD ; Leanne M Ward ; John A Hay PhD ; R. Baxter Willis ; Paul E Beale MD *

PURPOSE

Little is known on the etiology of the cam morphology associated with femoroacetabular impingement (FAI). The purpose of our study was to determine when the cam morphology associated with femoroacetabular impingement developed in a cross-sectional cohort study of pediatric patients pre- and post-physal-closure using magnetic resonance imaging (MRI).

METHOD AND MATERIALS

Alpha angles were measured at the 3:00 o'clock (anterior head-neck junction) and 1:30 (antero-superior head-neck junction) positions in both hips with a cam deformity defined as an alpha angle >50.5° at the 3:00 o'clock position.

RESULTS

Forty-four volunteers (88 hips) were studied: 23 with open physes (12 females, mean age 9.7 years; 11 males, age 11.7), 21 with closed physes (5 females, age 15.2; 16 males, age 16.2). None of the 23 (0%) patients pre-physal-closure had cam morphology, whereas 3 of 21 (14.3%, p=0.02; all males) post-closure had at least one hip with cam morphology. Mean alpha angles at 3:00 head-neck position were 38.1° (95% CI = 37.2° - 39.1°) in the open physes group, and 42.0° (95% CI = 40.16° - 43.90°) in the closed physes group; at the 1:30 head-neck position were 45.2° (95% CI = 44.0° - 46.4°) in the open physes group, and 50.1° (47.9° - 52.3°) in the closed physes group.

CONCLUSION

The presence of cam morphology in only the closed physal group strongly supports its development during the period of physal closure. Alpha angles showed significant differences between the 3:00 and 1:30 positions, with consistently greater alpha angles at the 1:30 (antero-superior head-neck junction) position. This has important implications for the diagnosis of cam morphology.

CLINICAL RELEVANCE/APPLICATION

Cam FAI morphology develops during the period of physal closure. In the pediatric population, as in adults, interpretation of alpha angles is dependent on radial MRI position.

CL-PDS-SU5A • Maturation of White Matter and Grey Matter Is 'Out-of-Sync' in Premature Born Infants

Stefan Bluml PhD (Presenter) ; Jessica L Wisnowski PhD ; Lisa Paquette ; Marvin D Nelson MD ; Ashok Panigrahy MD

PURPOSE

To compare metabolism of white matter and grey matter at equivalent post-conceptual (PC) age in term and preterm infants.

METHOD AND MATERIALS

MR examinations and medical records of 656 patients aged between 270 (term) - 370 post-conceptual (PC) days were reviewed. All subjects had clinically indicated MR examinations. However, 81 subjects had normal MRI (including normal diffusion MRI) and unremarkable clinical follow-up for a minimum of six months. Among these infants, 51 were full-term (gestational age (GA) at birth: 40 +/- 1 weeks) and 30 were premature-born (GA: 30 +/- 5 weeks). MR spectra acquired with single voxel PRESS (echo time 35ms, repetition time = 1.5s, 128 averages) of parietal white matter (WM) and parieto/occipital grey matter (GM) were analyzed with automated LCModel software and absolute metabolite concentrations were obtained. Metabolite versus age curves for term and preterm cohorts were generated and compared for statistical significant differences.

RESULTS

CONCLUSION

The biochemical maturation of white matter of term and preterm infants is significantly different whereas no significant differences were observed for grey matter. This indicates that mainly processes of WM maturation, such as axonal growth and possibly myelination are affected by premature birth. Consequently, the timing and synchronization of white and grey matter maturation is disturbed. There appears to be a "false start" of some maturational processes in WM triggered by physiological and/or stimulatory events after birth. This may contribute not only to the greater risk of long-term neurological problems of premature babies, but also to their higher risk for brain injury.

CLINICAL RELEVANCE/APPLICATION

Therapeutic interventions that aim to alleviate the possible adverse impact of prematurity on brain function may need to emphasize strategies that prevent a "false start" of white matter maturation.

CL-PDE-SU6A • The Pediatric Aorta: CTA and MRA Imaging of Inherited Connective Tissue Disorders

Kevin Ching MD ; Ariel Hsu MD (Presenter) ; Shobhit Madan MD, MPH ; Sameh Tadros MD, MSc

PURPOSE/AIM

Connective tissue disorders affecting the cardiovascular system may have unusual clinical presentations which lead to their eventual genetic diagnosis. Advanced vascular imaging with CTA and MRA plays a vital role in screening and follow up of arterial pathology. This exhibit will review the imaging findings of Marfan, Ehlers-Danlos, and Loeys-Dietz syndrome on CTA, MRA, and Cardiac-MR.

CONTENT ORGANIZATION

1. Overview of Marfan, Ehlers-Danlos, and Loeys Dietz Syndromes.

- a. Review of genetic mutations and disease classifications.
 - b. Unique clinical features with a focus on vascular pathology.
 - c. Signs, symptoms, and clinical presentation.
2. Arterial tortuosity, dissection, and aneurysmal dilatation on CTA, MRA, and Cardiac MR.
 3. Impact on the peripheral arteries and imaging findings on CTA and MRA.
 4. Treatment and recommendations for initial and follow up imaging.

SUMMARY

1. Inherited connective tissue disorders may have a profound effect on the central and peripheral arteries in children leading to arterial tortuosity, aneurysms, and dissection.
2. Advanced imaging techniques (Cardiac-MR, MRA, and CTA) are important for initial diagnosis and long-term screening.
3. Due to the importance of follow up imaging in pediatric patients with genetic vascular syndromes, non-ionizing radiation modalities should be highly considered.

CL-PDE-SU7A • MR Arthrography of the Pediatric Shoulder, Not just for Adults

Mittun C Patel MD (Presenter) ; Deepa R Biyyam MD ; Seth Vatsky DO ; Scott A Jorgensen MD ; Richard B Towbin MD

PURPOSE/AIM

MR Arthrography of the shoulder is being performed on adolescents more frequently and is immensely helpful in identifying surgical candidates. The purpose of this exhibit is to review shoulder MR Arthrography and injury patterns in children.

CONTENT ORGANIZATION

1. Review the normal anatomy of the shoulder
2. Review normal anatomical variants
3. Review the imaging findings of common and uncommon shoulder pathology
4. Review interesting postoperative changes

SUMMARY

MR Arthrography of the pediatric shoulder is now a common imaging tool utilized by orthopedic surgeons to evaluate children with shoulder injuries. As more adolescents become involved in competitive athletics, shoulder pathology encountered in the adult population is now being seen in children. We have seen an increase in imaging of both pediatric shoulder injuries and of the postoperative shoulder. MR arthrography is the modality of choice to evaluate the labrum, joint cartilage, ligaments of the shoulder, joint capsule and the rotator cuff. MR Arthrography efficiently triages patients who need surgical care. In order to accurately interpret shoulder MR arthrography, it is important for the Radiologist to be familiar with both shoulder pathology and postoperative changes.

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

Sunday, 01:00 PM - 01:30 PM • S101AB



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CL-PDS-SUB • AMA PRA Category 1 Credit™:0.5

CL-PDS-SU1B • Shoulder MRI with and without Arthrogram: Is the Needle Necessary to Diagnose Labral Tears in Children?

Isabelle Drolet MD (Presenter) ; Gavin Clague MBBS ; Jacob L Jaremko MD

PURPOSE

Shoulder labral tears can lead to long-term morbidity in youth. The definitive imaging test for labral tear, magnetic resonance (MR)-arthrogram, requires joint injection, which is logistically cumbersome, painful, and not entirely without risk. With improved MR sequences, non-contrast MRI might adequately detect labral tears. Our objective was to quantify the sensitivity of non-enhanced MR sequences vs. MR arthrograms for detection and classification of labral tears in children, in comparison to surgery, which is considered the gold standard.

METHOD AND MATERIALS

Ethics-approved retrospective review of pediatric (

RESULTS

Sixty-three of 65 surgical cases had labral tears confirmed operatively. These were detected at pre-arthrogram MR with SN 87%, SP 100%, PPV 100%, NPV 33%. At post-arthrogram MR, we had SN 82%, PPV 100%, but could not compute SP or NPV because all 33 post-arthrogram cases were positive at surgery. Sensitivity was highest for detection of antero-inferior and superior labral tears on both pre- and post-arthrogram MR and lowest for posterior labral tears.

CONCLUSION

If a labral tear is detected at pediatric non-arthrogram shoulder MR, this strongly predicts a finding of labral tear at surgery (PPV 100%). Depending on surgical preference, this may be sufficient information to avoid invasive arthrogram in these children. However, if a labral tear is not detected on pre-arthrogram MR and clinical suspicion is high, post-arthrogram MR is suggested, since the pre-arthrogram NPV is 33%.

CLINICAL RELEVANCE/APPLICATION

This study shows that invasive arthrogram MR could be avoided in children with a labral tear on non-arthrogram MR, but is still advisable when a labral tear is not detected on non-arthrogram MR.

CL-PDS-SU2B • Aberrant Insular Functional Connectivity in Children with Irritable Bowel Syndrome: A Resting-state fMRI Study

Bing Yu MD (Presenter) ; Na Chang ; Na Liu MD ; Qiyong Guo MD

PURPOSE

To explore the differential of connectivity between the insular lobe and other brain regions in children with irritable bowel syndrome (IBS) and healthy children by performing functional magnetic resonance imaging at resting state.

METHOD AND MATERIALS

Thirty IBS children (15 female; age 8 ± 2.1 y) and thirty controls (15 female; age 8 ± 1.2 y) were recruited. The functional MRI was performed at resting state on a 3.0T MR scanner. Insular connectivity was investigated by examination of the correlation between low frequency fMRI signal fluctuations in the insular lobe and those in all other brain regions. Insular connectivities of IBS children and controls were compared between groups.

RESULTS

Functional connectivities between the insular lobe and a set of regions were different in IBS children compared with controls. The functional connectivities of bilateral medial prefrontal cortex (MPFC) and left anterior cingulate cortex (ACC) between insular lobe were increased, however the connectivity between right amygdala and insular lobe was decreased.

CONCLUSION

The abnormal insular functional connectivities to bilateral MPFC, left ACC and right amygdala might be associated with the IBS.

CLINICAL RELEVANCE/APPLICATION

The abnormal insular functional connectivities to bilateral MPFC, left ACC and right amygdala might be associated with the IBS.

CL-PDS-SU3B • Quantitative Ventriculometry for Children Using MRI

Katsumi Hayakawa MD (Presenter) ; **Hiroyuki Tatekawa** MD ; **Sozo Okano** ; **Hiroko Matsushita** ; **Kozue Shiomi** ; **Naoe Satogami** MD ; **Masato Tanikake** MD ; **Ryota Fujimoto** MD ; **Hiroshi Kuroda**

PURPOSE

MRI is the promising tool for the evaluation of white matter injury at the term equivalent age for assessment of clinical outcome for premature infants. For the evaluation of white matter abnormality, one of the five area assessments on MRI is ventricular dilatation, which is graded into three degrees including normal, moderate and more global enlargement qualitatively. But this grading system was subjective. We assume that the relative atrial width which reflects white matter injury at the occipital and temporal lobe in addition to the Evans and Cella media ratios could improve the measurement of the lateral ventricular size. The aim of this study is to evaluate the clinical values of the new ventriculometry.

METHOD AND MATERIALS

The subjects consisted of 38 healthy neonates up to 32 weeks of age and 64 healthy children from 1 to 15 years of age as well as 67 children with white matter injury of PVL (N=48) and non-PVL (N=19). The measurement of lateral ventricle was done at the three points of frontal horn, atrium and cella media using T2-weighted image. The Evans ratio was the maximal frontal horn width divided by the maximal inner diameter between the inner tables at the same slice. The atrial ratio was the maximal atrium width divided by the maximal inner diameter between the inner tables at the same slice. The cella media ratio was the minimal width of the center of the lateral ventricle body divided by the maximal inner diameter between the inner tables at the same slice. The sum of the three ratios which could cover the entire cerebral white matter volumes was defined as the ventricular size.

RESULTS

The average ventricular sizes were 1.02 ± 0.056 (SD) for the neonates and 0.99 ± 0.044 for the children. As there was no significant difference between two age groups, we combined the two data and the average size was 1.00 ± 0.05 . On the other hand, the average ventricular sizes of the children with white matter injury were 1.16 ± 0.101 in PVL group and 1.20 ± 0.095 in non-PVL group and the combined average size of white matter injury groups was 1.17 ± 0.101 (vs normal children, p

CONCLUSION

The new developed ventriculometry using MRI is the useful and feasible for neonatal ventriculometry in busy clinical practices.

CLINICAL RELEVANCE/APPLICATION

White matter injury of premature neonates may cause ventriculomegaly, which reflects shrinkage of white matter volume. Quantitative ventriculometry is useful to assess cerebral white matter injury.

CL-PDS-SU4B • Value of Lower-limb MRI Examination for the Prediction of Joint Collapse in Hematological Pediatric Patients with Osteonecrosis of Femoral Heads and Condyles: Role of Lesion Volume Assessment

Alessandro Masetto MD (Presenter) ; **Davide Ippolito** MD ; **Pietro A Bonaffini** MD ; **Alessandra S Casiraghi** ; **Cammillo R Talei Franzesi** ; **Sandro Sironi** MD

PURPOSE

To assess the reliability of the measurement of the osteonecrotic lesion volume as a predictive factor of joint collapse in femoral heads and femoral condyles of pediatric patients treated for hematologic malignancies.

METHOD AND MATERIALS

A total of 120 patients with lymphoproliferative diseases, treated with chemotherapy and corticosteroids and/or bone marrow transplant and with clinical suspicion of osteonecrosis (ON), underwent a lower-limb MRI examination between June 2005 and January 2013. MRI studies were performed, both at baseline and during follow-up, on a 1.5T magnet (Achieva, Philips), with step-table technique and acquiring coronal short tau inversion recovery (STIR) and T1-weighted sequences from the hips to the ankles. On baseline MRI, the volumes of femoral heads (FHs), medial condyles (MCs), lateral condyles (LCs) and the osteonecrosis volume (ONV) were measured. The relative volumetric involvement (relative volume, RV) of the bone by necrosis was calculated (ON volume/epiphyseal bone volume) and the statistical analysis was performed with ROC curve test.

RESULTS

Twenty-six patients (9 males, mean age 15 years) presented ON affecting the femoral heads and/or condyles, for a total of 23 FHs, 23 MCs and 28 LCs. During the follow-up (11 ± 2 months), joint deformity was observed in 12 FHs, 2 MCs and 5 LCs. Considering a threshold of 24% of volume involvement, RV predicted joint deformity in 12/12 of FHs, with sensitivity=100%, specificity=90%, accuracy=95%, PPV=93% and NPV=100%. Using a threshold of 27% and 11% of volume involvement, RV predicted joint deformity in 2/23 (8%) of MCs (SN=100%, SP=57%, ACC=61%, PPV=9%, NPV=100%) and in 5/28 (18%) of LCs (SN=100%, SP=35%, ACC=46%, PPV=25%, NPV=100%), respectively.

CONCLUSION

In hematological pediatric patients with post-treatment osteonecrosis, RV proved to be a reliable parameter with a high prognostic value for the prediction of deformity in femoral heads, but not in distal femoral epiphyses.

CLINICAL RELEVANCE/APPLICATION

The measurement of RV of femoral heads affected by ON may offer complementary information, useful in the follow-up and management of hematologic pediatric patients.

CL-PDS-SU5B • Cerebral Perfusion Influences Signal Intensity in Sulci on FLAIR Imaging

Julie Harreld MD (Presenter) ; **Reem Awwad** MD ; **Noah D Sabin** MD, JD ; **Ying Yuan** PhD ; **Michael Rossi** ; **Wilburn E Reddick** PhD ; **John O Glass** MS ; **Qing Ji** PhD ; **Amar Gajjar** MD ; **Kathleen J Helton** MD ; **Zoltan Patay**

PURPOSE

Artificial sulcal signal intensity (SSI) on FLAIR MR imaging, common with anesthesia and supplemental oxygen (FiO₂), can mimic or obscure detection of leptomeningeal disease. Prior work (Harreld et al, ASNR 2012) suggests anesthetic effects on cerebral vasculature, blood flow (CBF) and volume (CBV) may be contributory. The purpose of this study was to investigate the relationship of SSI on pre and post-contrast FLAIR imaging to CBF, CBV and FiO₂ in patients receiving propofol, sevoflurane, or no anesthesia at MRI.

METHOD AND MATERIALS

Pre- and post-contrast FLAIR brain imaging in 39 children without leptomeningeal disease aged 1 to 18 years (8.97 ± 4.80 years) receiving no anesthesia (NA, n=13), propofol (n=21) or sevoflurane (n=5) were retrospectively reviewed and SSI graded by two independent neuroradiologists on a 5-point scale (0=no SSI, 4=significant SSI). CBF and CBV by DSC perfusion MRI were calculated for segmented gray matter (GM) and white matter (WM). Spearman's rank correlation, linear regression models and dominance analysis were used to investigate the effects of anesthesia group, FiO₂, WM and GM CBF and CBV on mean SSI.

RESULTS

Mean pre- and post-contrast SSI were positively correlated with anesthesia type (sevoflurane > propofol > NA, $r=0.83$, 0.78 for pre- and post-contrast SSI respectively), FiO₂ ($r=0.79$, 0.74), GM CBV ($r=0.57$, 0.54), WM CBV (pre-SSI only, $r=0.35$) and GM CBF (post-SSI only, $r=0.32$) (significance level: p

CONCLUSION

Cerebral perfusion, particularly GM CBV, appears to contribute to increased signal intensity in sulci on FLAIR imaging. The dominant role of anesthesia type may be due to a relationship with FiO₂ due to oxygen delivery device and effects on cerebral vasculature and perfusion

in addition to intrinsic T1 properties of anesthetic agents in CSF.

CLINICAL RELEVANCE/APPLICATION

Anesthesia may affect SSI in part through effects on cerebral vasculature and perfusion.

CL-PDE-SU7B • Climbing the Metabolic Peaks: MR Spectroscopy of Pediatric Brain Tumors

Nishard Abdeen MD (Presenter) ; Mohamed A Aggag MD

PURPOSE/AIM

The purpose of this exhibit is to demonstrate the practical application of MR spectroscopy to diagnosis of pediatric brain tumors and their mimics using a case based approach.

CONTENT ORGANIZATION

1. MR spectroscopy physics **2.** MR spectroscopy: the major metabolic peaks and what they mean **3.** MR spectroscopy: practical technique and pitfalls **4.** Illustrative Cases focussing on the contribution of MR spectroscopy to differential diagnosis: **Posterior fossa:** a. Medulloblastoma b. Ependymoma c. Atypical teratoid rhabdoid tumor **Supratentorial:** d. Choroid plexus carcinoma e. Glioblastoma multiforme f. Juvenile Pilocytic Astrocytoma g. Germinoma h. PNET i. DNET **Other:** j. Pineoblastoma k. Craniopharyngioma l. Meningioma m. Lymphoma n. Cerebral metastases **5.** Important mimics of brain tumors: demyelination, brain abscess, cerebellitis and radiation necrosis

SUMMARY

MR spectroscopy is a useful complement to conventional MR in the differential diagnosis of pediatric brain tumors. Some neoplasms are associated with characteristic and unusual peaks while in others the differential diagnosis is considerably narrowed. Familiarity with MR spectroscopy technique, pitfalls, and characteristic findings in various tumors will aid the radiologist to make an accurate diagnosis as well as distinguish important mimics which should not be treated as tumor.

CL-PDE3023-SUB • Pediatric Magnetic Resonance Urography: A Primer, including Systematic Approach to Review Interpretation

Elliot Dickerson MD (Presenter) ; Jonathan R Dillman MD * ; Ethan A Smith MD ; Robert L Lebowitz MD ; Michael A Dipietro MD ; Kassa Darge MD, PhD

PURPOSE/AIM

To provide a basic introduction to pediatric MR urography (MRU) technique, clinical indications, and a systematic approach to review/interpretation. To provide a basic introduction to the technical basis of pediatric MRU as well as a systematic approach to interpreting MRU.

CONTENT ORGANIZATION

We will present:

-Pediatric MRU technique and clinical indications.
-Data provided by MRU in children, including:

- Anatomy of renal parenchyma, collecting systems, ureters, and the bladder.
- Functional assessment, based on renal contrast material uptake and excretion.

-Advantages and disadvantages of MRU compared to other kidney/urinary tract imaging methods.

-Systematic approach for MRU review/interpretation.

-Numerous case-based examples of normal and abnormal anatomy/function, including complex/difficult cases where MRU affected clinical management.

SUMMARY

MRU is a useful tool for depicting both anatomy and function of the pediatric kidneys and urinary system. The technique can demonstrate abnormalities that are difficult to understand using conventional imaging modalities, and it can provide comprehensive evaluation minimizing the need for multiple imaging studies. This educational exhibit will demonstrate the clinical value of pediatric MRU and provide the audience with a basic approach to reviewing/ interpreting these exams..

Pediatric Radiology Series: Pediatric Musculoskeletal

Sunday, 02:00 PM - 03:30 PM • S102AB



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VSPD12 • AMA PRA Category 1 Credit™:3.75 • ARRT Category A+ Credit:4

Moderator

Paul K Kleinman , MD

Moderator

John D MacKenzie , MD

VSPD12-01 • Pediatric Hip Conditions Predisposing to FAI

Sarah D Bixby MD (Presenter)

LEARNING OBJECTIVES

1) Understand the difference between 'cam,' 'pincer,' and 'mixed' femoroacetabular impingement (FAI) syndromes. 2) Become familiar with accepted imaging parameters that help to establish the diagnosis of FAI in pediatric and adolescent patients. 3) Become familiar with pediatric hip conditions that may lead to FAI in patients, and understand the natural progression of these diseases. 4) Understand how imaging studies impact clinical management of patients with FAI.

ABSTRACT

Femoroacetabular impingement (FAI) may be considered cam-type, pincer-type, or mixed-type depending on whether the primary morphologic abnormality exists in the femur, acetabulum, or both. FAI has generated attention in the literature given its association with osteoarthritis of the hip as well as debilitating hip pain. Children and adolescents may develop FAI, which can lead to devastating joint damage at a relatively early age if left undetected and/or untreated. Certain populations of pediatric patients, such as those with slipped capital femoral epiphysis (SCFE) or Legg-Calvé-Perthes disease (LCP) will almost certainly develop FAI even after their primary disease has been treated. Radiologists will assist their clinical colleagues by suggesting the diagnosis on imaging examinations based on certain imaging parameters, which will be reviewed. In patients with confirmed FAI based on history, physical exam findings, and imaging, MRI examinations of the hip with radial sequences and cartilage sensitive sequences may be helpful to orthopedists as they consider surgical versus nonsurgical options. These techniques will be discussed.

VSPD12-02 • MR Findings of Femoroacetabular Impingement (FAI) in Healed Perthes Stulberg Class 3, 4 and 5 Hips. Does MR Have a Role in Preoperative Evaluation?

Siddharth P Jadhav MD (Presenter) ; J. H Kan MD ; Scott B Rosenfeld MD

PURPOSE

To evaluate the use of MRI as a complement to the Stulberg classification in the pre-operative work-up of FAI secondary to healed

METHOD AND MATERIALS

We performed retrospective evaluation of MR arthrography (MRA) findings in patients with healed Perthes disease. Patients presented over a period of 6 years (2008-2013) with hip pain and clinical signs of FAI. We included patients with hip radiographs and pre-operative dedicated MRA of the hip joint. A total of 16 hips in 15 patients were included. The radiographic findings were classified according to the Stulberg classification. The MRA was evaluated for abnormal alpha angles using radial imaging to evaluate the degree and location of CAM-type circumferential abnormality with alpha angle threshold of 55 degrees. MRA was also reviewed for presence and extent of labral tears and articular cartilage damage. These findings were correlated with the Stulberg classification

RESULTS

Mean age was 14.9 years (range: 10.5 to 21.8 years; 40% female). Nine hips were Stulberg Class III, six hips were Stulberg class 4 and 1 hip was Stulberg class V. 3 hips had 50% circumferential CAM deformity. For the 8 with >50% CAM deformity, 5 (56%) were class III, 2 (33%) were class IV hips and 1 (100%) was class 5 hips. 13 hips (81%) had labral tears which most commonly involved the anterior and superior labrum. 11 hips (69%) had abnormal femoral articular cartilage and 6 hips (37.5 %) had abnormal acetabular cartilage. The femoral head cartilage abnormalities were most severe posteriorly and centrally. Full thickness cartilage loss was present in 2 class III hips (22%) and 4 class IV hips (67%). The labrum was torn in 8 class III hips (89%) and 5 class IV hips (83%)

CONCLUSION

MRA provides additional information about the exact location of the aspherical portion of the femoral head and neck, the size and location of a cam lesion, as well as the status of the labrum and articular cartilage in patients with healed Perthes disease. From an orthopaedic perspective, this can assist in making treatment decisions, planning surgery, and counseling the patient about the likelihood of success of hip preservation surgery

CLINICAL RELEVANCE/APPLICATION

Routine use of MRA can provide information in addition to that derived from the radiographic Stulberg classification. This facilitates the orthopaedic management of patients with healed Perthes

VSPD12-03 • Normative Shape Analysis of the Developing Piglet Femur in Forming a Metric for Characterizing Femoral Head Deformation Following Experimentally Induced AVN

Andy Tsai MD (Presenter) ; Susan A Connolly MD ; Arthur Nedder ; Frederic Shapiro

PURPOSE

Childhood idiopathic AVN of the hip (Legg-Calve-Perthes disease) results in considerable morbidity. To simulate this disease for laboratory study, we used an AVN model in a skeletally immature piglet hip created by placement of a tight silk ligature around the base of the femoral neck and sectioning of the ligamentum teres, rendering the femoral head completely avascular. The temporal characterization of this piglet's deforming femur, based on the metric established from a normative shape database we derived from a population of normal piglet femurs, forms the basis for this paper.

METHOD AND MATERIALS

Normative piglet femur developmental data was generated via serial CT images of bilateral femurs from 3 normal piglets at regular time intervals. We applied a shape analysis technique to this data set using level set method as the shape descriptor and principal component analysis as the feature selector in deriving a shape subspace that compactly describes the normal development of the piglet femur. This parametric subspace efficiently captures the major temporal changes of the femurs, and can be used as an effective metric in quantifying how much a query femur deviates from the norm. We applied this shape metric to the experimental femur data generated via serial CT images of a piglet following experimental unilateral induction of femoral head AVN. The contralateral femur served as the control.

RESULTS

The application of this shape metric to the experimental data traces out a deformation trajectory over time of the diseased femur that progressively differs from the trajectory of the same piglet's contralateral normal femur. Hence, this computational framework can objectively indicate the time point when the shape of the femur starts to deviate from the norm, and the amount of deviation. As a by-product, this technique's intuitive 3D visualization of the shape changes (via variations of selected eigenmodes and surface distance-difference colormaps) reveals patterns of changes in the normal and abnormal development of the femur that solidifies widely-accepted clinical observations.

CONCLUSION

The clinical application of this analysis tool is expected to play an important tool in (1) assessing disease progression; (2) directing clinical intervention; and (3) gauging the effectiveness of treatment.

CLINICAL RELEVANCE/APPLICATION

This methodology may potentially revolutionize the diagnosis and treatment protocol of pediatric hip AVN.

VSPD12-04 • Symptomatic Pediatric Developmental Osseous Variants

Paul K Kleinman MD (Presenter)

LEARNING OBJECTIVES

1) Learn the important normal anatomic variants that may cause disease. 2) Learn the important normal anatomic variants that may simulate disease. 3) Learn the problematic variants that are indeterminate and require further imaging and follow up.

ABSTRACT

A wide range of normal variants may be encountered in the pediatric skeleton. Differentiation of innocent variants from those with superimposed acute/chronic trauma may pose a challenge radiographically. Opposite comparison views may be helpful. MRI usually resolves the issue...but not always. Correlation with clinical findings is essential.

VSPD12-05 • Apophyseal Joint Inflammation in Patients with Enthesitis Related Arthritis; Serial Observations and Correlation with Concurrent Sacroiliitis

Tom Amies MBBS, BSc (Presenter) ; Kanimozhi Vendhan MBBS, DMRD ; Debajit Sen ; Corinne Fisher ; Yiannakis Ioannou ; Margaret A Hall-Craggs MD

PURPOSE

To observe changes in apophyseal joint inflammation on serial scans in patients with enthesitis related arthritis (ERA), and to correlate this with sacroiliitis.

METHOD AND MATERIALS

We performed a retrospective review of serial MRI lumbar spine scans of ERA patients attending the adolescent rheumatology clinic at our institution. The duration of follow up ranged from 3 months to 4yrs 10 months. Scan protocol consisted of sagittal T1, sagittal STIR and sagittal T1 contrast enhanced images of the lumbar spine along with contrast-enhanced coronal and axial imaging of the sacroiliac joints. Images were reviewed by an expert MR reader. As there is no universally accepted grading criteria to assess apophyseal joint inflammation in adolescents, we adapted and modified a grading system used in adults. Sacroiliitis was graded as stable, improved, worse or as mixed response when some regions showed improvement with other parts of the joint showing worsening inflammation.

RESULTS

A total of 70 scans were available in 29 ERA patients. Apophyseal joint inflammation was present in 15 of 29 patients. Amongst these 9 were on disease modifying anti-rheumatic drugs, 3 on anti-TNF therapy and the other 3 on NSAIDS. In 6 of 15 the apophyseal joint synovitis and sacroiliitis moved in the same direction i.e they either became worse or better together. However in 9 of 15 the apophyseal joint synovitis and sacroiliitis behaved differently, i.e with worsening apophyseal joint inflammation on serial scans the sacroiliitis either stayed stable or showed improvement.

CONCLUSION

We have shown that apophyseal joint synovitis and sacroiliitis can respond independent of one another. This is a novel finding.

CLINICAL RELEVANCE/APPLICATION

Concurrent sacroiliitis and apophyseal joint synovitis in patients with enthesitis related arthritis can respond differentially with therapy. This could account for persistent pain.

VSPD12-06 • A Description of Inflammatory Changes of the Lumbar Spine in Patients with Enthesitis-related Arthritis

Kanimozhi Vendhan MBBS, DMRD ; **Tom Amies** MBBS, BSc (Presenter) ; **Corinne Fisher** ; **Debajit Sen** ; **Yiannakis Ioannou** ; **Margaret A Hall-Craggs** MD

PURPOSE

To assess inflammatory changes in the lumbar spine in a cohort of patients with enthesitis-related arthritis (ERA) as compared to a control group of adolescents with mechanical back pain.

METHOD AND MATERIALS

We performed a retrospective case control study and reviewed MRI lumbar spine scans of a total of 83 patients (62 cases;21 controls). Images were reviewed by an expert MR reader who was blinded to clinical details. The presence or absence of morphological features of enthesitis (oedema of corners of vertebral endplates), facet joint synovitis (articular process oedema,enhancing synovitis) and inflammation of the posterior elements (enhancement of interspinous ligaments and spinous process) was assessed at each lumbar vertebral level. Facet joint synovitis was subjectively graded from 0 to 3 (0 being normal and 3 being severe). As there is no universally accepted grading criteria to assess facet joint inflammation in adolescents, we adapted and modified a grading system used in adults. The presence or absence of sacroiliitis (erosions of articular surface, bone marrow oedema and enhancement) was also recorded. STATA software was used for data analysis.

RESULTS

One or more abnormalities of the lumbar spine were found in 47 (76%) of 62 ERA cases. MR evidence of facet joint synovitis was seen in 24 (39%) of cases and in 1 patient (5%) in the control group. This difference was highly significant (p value = 0.003). Amongst patients with abnormal facet joints (n=24), grade 1 synovitis was present in 9 (37%) , grade 2 lesions in 10 cases (42%) and grade 3 synovitis in 5 cases (21%) . Overall 47 of the 62 cases showed evidence of sacroiliitis. None of the patients in the control group had sacroiliitis. Inflammatory changes in the SIJs were accompanied by abnormalities of the lumbar spine in 36 cases (58%). In 5 of 24 ERA cases with facet joint synovitis there was no MR evidence of sacroiliitis. This is a novel observation. There was no statistically significant difference between the cases and controls in the prevalence of disc changes, end plate oedema and inflammation of the posterior elements.

CONCLUSION

Facet joint inflammation was seen in 39% of ERA patients. This is a previously undescribed finding and could contribute to back pain in these children.

CLINICAL RELEVANCE/APPLICATION

Lumbar spine inflammatory disease should be considered as a cause of back pain in patients with ERA, independent of the presence of sacroiliitis.

VSPD12-07 • ACL Reconstruction in the Skeletally Immature Patient: Current Concepts in Diagnosis and Treatment

Craig Finlayson MD (Presenter) *

LEARNING OBJECTIVES

1) Participants will identify anatomic and neuromuscular risk factors for ACL injury in the young patient. 2) Participants will work through the differential diagnosis of acute ACL tear and identify associated injury patterns in the young patient. 3) Participants will understand the risks of ACL reconstruction unique to the young patient.

ABSTRACT

Although once thought to be rare, anterior cruciate ligament injuries are being diagnosed with increasing frequency. Controversy exists regarding the management of ACL injuries in patients with open physes. Nonoperative management of complete tears in skeletally immature patients generally has a poor prognosis in terms of knee function and is associated with progressive intra-articular injury. Conventional surgical techniques for ACL reconstruction risk iatrogenic growth disturbance because of physal violation, and cases of growth disturbances have been reported in several studies. This module will discuss the pathophysiology, diagnosis and prevention of ACL injuries in the skeletally immature as well as some of the risks and controversy regarding surgical treatment.

Mentored Case Approach to Pediatric Cardiovascular Disease 1: Vascular Disease (An Interactive Session)

Monday, 08:30 AM - 10:00 AM • E353B

PD **VA**

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RC224 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

S. Bruce Greenberg, MD

Director

Rajesh Krishnamurthy, MD *

S. Bruce Greenberg, MD

Cynthia K Rigsby, MD

Taylor Chung, MD

LEARNING OBJECTIVES

1) Understand the morphology, treatment, and long term complications of treated and untreated congenital heart disease via an interactive mentored-case approach with audience response system. 2) Highlight appropriateness of MRI and CT with regard to technique, pitfalls, indications and critical imaging findings that affect management for common imaging scenarios, including vascular rings and slings, coarctation, aortopathy, coronary anomalies, and congenital pulmonary arterial and venous anomalies. 3) Provide an opportunity for general radiologists, pediatric radiologists and cardiac imagers who have limited exposure to this area in their workplace an opportunity to refresh their pediatric cardiovascular imaging skills in a focused manner.

Pediatric Radiology Series: Fetal - Neonatal Imaging

Monday, 08:30 AM - 12:00 PM • S102AB

VSPD21 • AMA PRA Category 1 Credit™:3.25 • ARRT Category A+ Credit:4

Moderator
Christopher I Cassady, MD
Moderator
Beth M Kline-Fath, MD
Moderator
Richard A Barth, MD *

VSPD21-01 • Fetal Neuro Imaging

Beth M Kline-Fath MD (Presenter)

LEARNING OBJECTIVES

1) The participant will briefly review basic prenatal neurosonology and fetal MR imaging sequences. 2) The embryology of the fetal brain will be correlated with important landmarks identified on MR imaging for each gestational age. 3) The learner will be able to utilize the appearance of the germinal matrix, brain parenchymal signal, sulcation and myelination to verify normal fetal brain anatomical milestones.

ABSTRACT

VSPD21-02 • Does Fetal MRI Add Clinically Important Information in Cases of Isolated Ventriculomegaly Revealed by Tertiary Antenatal Ultrasound?

Stacy K Goergen MBBS (Presenter) ; **Tejaswi Kandula** MBBS ; **Michael Fahey** MBBS, PhD *

PURPOSE

Antenatal counselling for fetal cerebral ventriculomegaly (VM) is guided by size of the ventricles and the presence and nature of concurrent structural abnormalities. There are limited consensus guidelines regarding the role of fetal magnetic resonance imaging (FMRI) as an adjunct to ultrasound (US) in cases of isolated VM (IVM). The evidence suggests that MRI is indicated when IVM on US is severe (>15mm), but there is less agreement about its role when IVM is mild or moderate (10-15mm). Our aim was to evaluate the incidence of additional findings on FMRI when IVM is identified on tertiary level antenatal US.

METHOD AND MATERIALS

We prospectively analyzed data from a single university affiliated, tertiary referral fetal diagnostic / therapy unit. Inclusion criteria were singleton or twin pregnancies evaluated with antenatal US performed prior to FMRI with a resulting diagnosis of IVM. Amniocentesis was offered prior to FMRI but variably performed depending on maternal preference.

RESULTS

59 pregnancies studied between November 2006 and February 2013 fulfilled inclusion criteria. Median gestational age at US was 26 weeks (21-36) and timing of FMRI was 28 weeks (22-37). Median time elapsed between US and FMRI was 7 days (0-21). In 41/59 cases, there was agreement between ultrasound and MRI regarding severity of VM. Additional findings on FMRI were seen in 5/42 fetuses (11.9%) with US diagnosed mild VM, 0/10 with moderate VM, and 4/7 (57.1%) with severe VM. Of these 9 cases, 2 had amniocentesis both with a normal result. The additional findings were clinically significant in 2/5 cases with mild VM compared with 4/4 cases with severe VM. These included periventricular nodular heterotopia, foramen of Monro subependymal nodule in tuberous sclerosis, absent septum pellucidum with postnatal diagnosis of septo-optic dysplasia, and agenesis of the corpus callosum.

CONCLUSION

Clinically significant cranial abnormalities on FMRI, specifically midline anomalies and malformations of cortical development, were identified in 5% of fetuses with mild to moderate IVM on tertiary antenatal US. The low rate of additional findings in this group is consistent with other recently published data.

CLINICAL RELEVANCE/APPLICATION

The low yield of clinically important abnormalities on FMRI when VM is isolated and mild to moderate in severity on high quality antenatal US should inform antenatal counselling and referral pathways.

VSPD21-03 • Can Prenatal US Stand Alone to Diagnose Microcephaly or Is Fetal Head MRI Needed?

Gal Yaniv MD, PhD (Presenter) ; **Eldad Katorza** ; **Vered P Tsehmaister Abitbol** MD ; **Gilad Twig** ; **Salim Bader** ; **Eli Konen** MD ; **Chen C Hoffmann** MD

PURPOSE

To evaluate the agreement between ultrasound (US) and fetal head magnetic resonance imaging (feMRI) head biometry.

METHOD AND MATERIALS

A retrospective analysis was performed on 60 sequential feMRI scans obtained between 2011-2013 following US diagnosis of microcephaly w/wo severe intrauterine growth retardation (IUGR: head circumference =-2 standard deviations [SD] and estimated fetal weight [EFW] =2 SD). Inclusion criteria were single fetus and fewer than 21 days between performance of US and feMRI. The mean gestational age (GA) of fetuses at US and feMRI acquisition was 33±3.3 and 34±3 weeks, respectively. The mean interval between US and feMRI scanning was 7.3±6 days. Biparietal diameter (BPD) and occipitofrontal diameter (OFD) results were converted to percentiles and SD by Chervenak and Hadlock normograms for US and compared to Garel normograms for feMRI. US measurements of OFD were recorded in 36/60 of the scans. Data on GA, EFW and interval between scans were also recorded.

RESULTS

Forty-two of the 60 fetuses with US-suspected microcephaly (70%) were IUGR. BPD values were =-2 SD in only 5 (8.3%) according to feMRI (PP

CONCLUSION

There is discrepancy between US and feMRI findings in the assessment of fetal head biometry. US measurements are performed only on the skull, while feMRI enables direct measurement of the brain. Abnormal anatomical findings are more predictive for true microcephaly in both US and feMRI. Thus, diagnosis of microcephaly by US alone is not sufficient and should be validated by feMRI before a final diagnosis is established and consultations with the parents are held.

CLINICAL RELEVANCE/APPLICATION

The diagnosis of microcephaly can lead to pregnancy termination, and diagnosis by US alone is insufficient and requires confirmation by a feMRI study.

VSPD21-04 • Evaluation of ADC Values of the Dead Fetus Compared to Fetal Brain Infarct and Normal Siblings in Twin Pregnancies Complicated with TTTS

Ronen Bercovitz RT, MA (Presenter) ; **Boaz Weisz** ; **Gal Yaniv** MD, PhD ; **Chen C Hoffmann** MD ; **Shlomo Lipitz** ; **Anat Biegon** ; **Eldad Katorza**

PURPOSE

To evaluate the ADC values in the dead fetus, compared to brain infarct and to normal sibling in cases of monochorionic diamniotic (MCBA) twins, suffering from complications of twin to twin transfusion syndrome (TTTS).

METHOD AND MATERIALS

A retrospective analysis was performed on 70 sequential MRI scans of fetuses in cases of MCBA pregnancies complicated with TTTS between 2009-2012. 15 women with MCBA pregnancies (mean maternal age 31 years, gestational age range 18-32, 1-4 scans/subject) were included. Follow up scans performed 1-72 days after ischemia to monitor the living remaining fetus. Whole brain ADC values (expressed in $\text{mme}^2/\text{secx}10^9$) were obtained at 5 weeks after ischemia. In the cases with infarcts ADC was measured in the infarcted zone. All measurements were performed using a GE workstation. The results of the dead fetuses and of the infarcted zones in the living fetuses were compared to the normal siblings

RESULTS

The mean (SD) ADC value in the normal fetuses was 1675 (277), compared to 684 (165) in dead fetuses and 1097 (546) in infarcted brains (p

CONCLUSION

The ADC value in dead fetuses increases slowly with time, and does not reach normal values even months after death, while the values in the infarcts of the living fetus normalize within 2 weeks, as was reported in early life and in adulthood. The reason for this phenomenon is unclear, and may be due to the unchanged environment of the dead fetus while the pregnancy continues with the second healthy sibling. A second factor may be lack of blood flow in the dead fetus, thus the tissue is 'frozen' and not liquefied.

CLINICAL RELEVANCE/APPLICATION

The time of death of a fetus cannot be determined by the low ADC value, which can stay low for more than 5 weeks.

VSPD21-05 • Congenital Diaphragmatic Hernia: Fetal and Neonatal Correlation

Christopher I Cassidy MD (Presenter)

LEARNING OBJECTIVES

1) Identify the application of basic anatomic, pathologic, and physiologic principles to congenital diaphragmatic hernia. 2) Analyze imaging and therapeutic techniques and apply this knowledge to protocol development, patient management/safety, and cost in the management of CDH. 3) Demonstrate understanding of the influence of socioeconomic issues on current and future practice patterns for this referral. 4) Compare indications for specific imaging strategies in CDH.

VSPD21-06 • Correlation of the Observed-to-Expected MR Fetal Lung Volume and the Observed-to-Expected US Lung-to-Head Ratio at Different Times of Gestation in Fetuses with Congenital Diaphragmatic Hernia

Katrin Kastenholz (Presenter); **Anna Walleyo**; **Christel Weiss**; **Angelika Debus MD**; **Claudia Hagelstein MD**; **Meike Weidner**; **Thomas Schaible**; **Stefan O Schoenberg MD, PhD ***; **Karen Busing**; **Sven Kehl MD**; **Wolfgang Neff MD, PhD**

PURPOSE

Determination of the observed-to-expected MR fetal-lung-volume (o/e MR FLV) and observed-to-expected US lung-to-head ratio (o/e US LHR) are both quantitative methods to predict clinical outcome in fetuses with congenital diaphragmatic hernia (CDH). The purpose of this study was to evaluate the potential of the o/e MR FLV and o/e US LHR to evaluate survival, need for extracorporeal membrane oxygenation (ECMO) therapy and development of chronic lung disease (CLD) at different times of gestation (32 weeks gestation (w.g.)) and especially to individually compare the o/e MR FLV and the o/e US LHR for each fetus.

METHOD AND MATERIALS

In total 201 fetuses were included in this study and o/e MR FLV and o/e US LHR were calculated for 270 examinations performed within 72 hours (62 examinations 32 w.g.). Prognostic accuracy of o/e MR FLV and o/e US LHR was assessed by performing receiver operating characteristic curve (ROC) analysis and correlation was determined using linear regression analysis.

RESULTS

At all times of gestation investigated our results revealed significant differences of both o/e MR FLV and o/e US LHR for neonatal survival or no survival, need for ECMO therapy and development of CLD or not (p-values between

CONCLUSION

O/e MR FLV and o/e US LHR are highly valuable prognostic parameters for prenatal prediction of survival, need for ECMO therapy and development of CLD in fetuses with left sided CDH for all times of gestation. No prognostic significance was obtained in cases of right sided CDH. O/e MR FLV and o/e US LHR correlate significantly for patients with left sided CDH, best when examinations are performed prior to 32 w.g.. No significant correlation of both parameters could be found in fetuses with right sided CDH.

CLINICAL RELEVANCE/APPLICATION

O/e MR FLV and o/e US LHR are reliable prognostic parameters and correlate well for prenatal prediction of survival, need for ECMO therapy and development of CLD in fetuses with left sided CDH.

VSPD21-07 • Magnetic Resonance Imaging Based Ratio of Fetal Lung Volume to Fetal Body Volume as a New Prognostic Marker in Growth Restricted Fetuses with Congenital Diaphragmatic Hernia

Meike Weidner (Presenter); **Claudia Hagelstein MD**; **Angelika Debus MD**; **Anna Walleyo**; **Christel Weiss**; **Stefan O Schoenberg MD, PhD ***; **Thomas Schaible**; **Karen Busing**; **Wolfgang Neff MD, PhD**

PURPOSE

Several prenatal prognostic parameters for fetuses with congenital diaphragmatic hernia (CDH) exist. Most of them reference to a control group, which can be problematic if individual fetal development differs from expectation. To overcome this, we evaluated the prognostic accuracy of the individually calculated magnetic resonance imaging (MRI) based ratio of fetal lung volume (FLV) to fetal body volume (FBV) concerning survival in congenital diaphragmatic hernia (CDH), especially in fetuses with growth restriction.

METHOD AND MATERIALS

RESULTS

CONCLUSION

The MRI based ratio (FLV/FBV) is a highly reliable prenatal predictor of neonatal survival in children with CDH. Unlike other prognostic parameters (e.g. observed/expected MR-FLV, ultrasound based observed/expected lung-to-head ratio) it is independent of reference to a control group and can also be used in patients whose growth development differs from expectation.

CLINICAL RELEVANCE/APPLICATION

The measurement of fetal body volume supplementary to fetal lung volume may enhance prognostic accuracy in cases of congenital diaphragmatic for individuals whose growth development is restricted.

VSPD21-08 • Congenital Bronchopulmonary Malformations (BPMs) - Prenatal Sonographic Features with Postnatal Correlations. A Single Institution Experience

Juliette Garel MD (Presenter); **Laurent A Garel MD**; **Dorothee Dal Soglio MD**; **Francoise F Rypens MD**; **Chantale Lapierre MD**; **Josee Dubois MD**; **Andree Grignon MD**

PURPOSE

BPMs include bronchogenic cysts (BC), bronchial atresias (BA) either isolated or associated with intralobar pulmonary sequestrations (ILPS), congenital pulmonary airways malformations (CPAMs) type I and II, and extralobar pulmonary sequestrations (ELPS) - (Claire Langston classification). Recent literature on congenital lung lesions emphasized the lack of correlations between imaging and pathology.

Our purpose is to compare the prenatal sonograms of BPMs and postnatal diagnoses in a single institution cohort.

METHOD AND MATERIALS

Retrospective study over 10 years. Pre and postnatal imaging performed in same radiology department. Prenatal descriptors = timing of conspicuity, lesion echogenicity, macrocysts, vascular connections (systemic feeder, venous return), bronchocele. Postnatal diagnoses based upon pathology (surgical cases) or postnatal CT (non-operated cases).

RESULTS

115 cases, including 56 surgical cases, and 5 upcoming interventions. Postnatal diagnoses = BC (n=5), CPAM (n=33), PS (n=33) including 11 hybrid lesions (coexisting PS and CPAM), trapping (n=32) including 10 BA, suprarenal PS/hybrid (n=12). Non-surgical cases (n=54): suprarenal location (n=12), spontaneous regression (n=17), embolization (n=3), lost to F.U. (n=8), expectant management (n=12), fetal demise (n=2). Prenatal ultrasound and postnatal correlations = all BPMs visible on mid 2nd trimester US; macrocystic BPMs = CPAM type I and II, or hybrid lesions (intrapulmonary BC often considered at pathology as monocystic CPAM type I equivalent); echoic lesions with systemic vascularization = PS; echoic lesions without systemic vascularization = trapping; bronchocele seen in BA.

CONCLUSION

- Conspicuity timing = BPMs always visible on 18-22 WGA sonogram, to the contrary of fetal pulmonary tumors (3 cases in our data bank). - PS almost equally made of ELPS and ILPS (value of color Doppler ultrasound for assessing venous return). - Focal echoic lesions without systemic feeder likely to be trapping (no CPAM type III in our series). Fetal bronchocele very suggestive of BA. Overall, excellent ultrasound pathology correlations, resulting in an improved management (investigations and treatment options) postnatally.

CLINICAL RELEVANCE/APPLICATION

Routine US has resulted in a marked increase in prenatally recognized BPMs. Salient US features allow for a reliable prenatal diagnosis of the various BPMs and for a better management postnatally.

VSPD21-09 • Pediatric Genitourinary Imaging: Fetal and Neonatal Correlation

Jeanne S Chow MD (Presenter)

LEARNING OBJECTIVES

The purpose of this presentation is to review typical prenatal imaging findings of congenital anomalies of the genitourinary tract, the typical evaluation and appearance of these findings post-natally, and the management of these anomalies

VSPD21-10 • Radiation Dose Reduction at MDCT for the Prenatal Diagnosis of Skeletal Dysplasia

Chihiro Tani MD (Presenter) ; **Yoshinori Funama PhD** ; **Chikako Fujioka RT** ; **Yukiko Honda MD** ; **Yuko Nakamura MD** ; **Kazuo Awai MD *** ; **Shuji Date** ; **Yoko Kaichi** ; **Daisuke Komoto MD**

PURPOSE

To determine the sufficient minimum radiation dose for the prenatal diagnosis by MDCT of skeletal dysplasia using fetal specimens.

METHOD AND MATERIALS

This study received institutional review board approval for the use of 15 fetal specimens (gestational age: 24 - 36 weeks). The specimens were immersed in 5% formalin in a plastic container that approximated the abdominal circumference of pregnant women. CT scans were acquired with a 64-detector scanner (VCT, GE). The scanning parameters were: tube voltage 100kVp, tube current 600-,300-,150-,100-, and 50mA, rotation time 0.4 sec, pitch 1.375. Images were subjected to adaptive statistical iterative reconstruction (ASiR, blending rate: 60%). First, we measured fetal dose in 5 specimens using 4 glass dosimeters attached on the surface of fetus, and calculated the mean of the measured dose. Furthermore, we calculated the mean of the measured dose in 5 specimens in each tube current. Then, in each tube current CT scanning of all 15 specimens, image quality was evaluated as follows. In each scan protocol of each specimen, we generated maximum intensity projection and volume rendering images of the fetal skeleton. Two radiologists recorded the visualization of a metatarsal, metacarpal, the 12th rib, fibula, and femoral metaphysis using a visual score where 3=clear, 2=unclear, 1=not visible. We performed statistical analysis of the diagnostic ability of each scan protocol using Steel's test. Standard image quality was considered obtainable at 600mA.

RESULTS

The fetal exposure dose was 10.2 mGy at a tube current of 600mA, 5.3 at 300mA, 2.5 at 150mA, 1.8 at 100mA, and 0.9 at 50mA. In visual evaluation of images, without ASiR there was a statistically significant difference between 50- or 100mA images and 600mA images (50mA:p

CONCLUSION

At MDCT for the prenatal diagnosis of skeletal dysplasia, the radiation dose for images acquired with ASiR the fetal radiation dose can be reduced to 1.8mGy.

CLINICAL RELEVANCE/APPLICATION

MDCTscans obtained at 100mA, 100kVp, and ASiR are of sufficient diagnostic quality for the prenatal diagnosis of skeletal dysplasia and their radiation dose is low (1.8 mGy).

VSPD21-11 • Challenges and Controversies in Imaging Necrotizing Enterocolitis

Charles M Maxfield MD (Presenter)

LEARNING OBJECTIVES

1) Recognize imaging features of necrotizing enterocolitis. 2) Discuss imaging algorithm to the diagnosis and follow-up of necrotizing enterocolitis. 3) Review clinical features and pathophysiology of necrotizing enterocolitis.

VSPD21-12 • The Superficial Echogenic Lesions Detected in Neonatal Cranial Ultrasonography: A Possible Indicator of Significant Birth Trauma

Byoung Hee Han (Presenter) ; **Sung Bin Park MD** ; **Kyung Sang Lee** ; **Sun Young Ko** ; **Yeon Kyung Lee**

PURPOSE

To evaluate the characteristics and the significance of the superficial echogenic lesions(SEL) in neonatal cranial ultrasonography(US).

METHOD AND MATERIALS

We retrospectively reviewed the clinical records and neuroimaging studies of forty neonates who showed SEL on neonatal cranial US. MRI was taken in 18 of them within 2 weeks after US. We evaluated the location, number, size and follow-up changes of SEL and the associated lesions to know the clinical significance of SEL.

RESULTS

The echogenic lesions were positioned around the sulci in 39 cases and considered as brain parenchymal lesions accompanying with subarachnoid hemorrhage (SAH). Only in one case, the lesion was positioned intraparenchymally. On US, the locations of the lesions were mainly frontal and parietal in 38 cases and occipitotemporal in 5 cases. The lesions were single in 13 and multiple in 27 cases. The maximal size of the lesions were 5 to 30mm(mean 15mm). There were associated other hemorrhagic lesions in subdural(SDH=12), epidural(EDH=4), intraventricular(IVH=2) location. One SDH was accompanied by skull fracture. Three EDH were combined with skull fractures. Cephalhematoma or caupt succedaneum were noted in 15 cases and five(33.3%) of them were associated with EDH and fracture associated SDH. On follow up study, the SELs evolved and disappeared until 3 months on follow-up US.

CONCLUSION

The SEL in neonatal cranial US involves brain parenchyma and leptomeningeal space. Although SEL itself is usually not significant clinically, it can be one possible indicator of significant birth trauma such as EDH and SDH with skull fracture especially when it combines with cephalhematoma or caput succedaneum.

CLINICAL RELEVANCE/APPLICATION

Cranial ultrasonography can easily detect the superficial echogenic lesions of neonatal brain and if it is found and scalp hematoma is present, MRI should be recommended to detect intracranial hematoma

VSPD21-13 • Comparison of Clinical US Measurements of the Ventricles to 3D US Ventricle Volumes in IVH Patients

Jessica E Kishimoto (Presenter) ; **Walter M Romano** MD ; **Aaron Fenster** PhD * ; **David Lee** MD, FRCPC ; **Sandrine De Ribaupierre**

PURPOSE

Premature neonates with intraventricular hemorrhage (IVH) are followed with serial 2D US, head circumference (HC) measurement, as well as clinical examination to determine if they require treatment for hydrocephalus. However, accurate volume measurements are impossible with 2D images, and one relies on ratios and width of ventricles to estimate the changes in ventricular volume. 3D ultrasound (US) has been proven feasible in a clinical setting in this population, and ventricular volumes from those images have been comparable to those made in MRI. Since 2D US and HC measurements have historically been used clinically, we aimed to compare those clinical standard measurements against 3D US ventricular volumes.

METHOD AND MATERIALS

A Philips HDI 5000 US machine with a C8-5 transducer was used for all 2D US exams. 3D US images were acquired, using the same probe, attached to a system that generated 3D images by mechanically moving the transducer. HC measurements were recorded on the days US images were acquired. Five IVH patients were scanned 1-2 times/week for the duration of their stay in the NICU, for a total of 7-11 scans per patient. Total of 47 scans for all patients investigated. Levene's index (LI), axial horn width (AHW), third ventricle width (3rd) and the thalamo-occipital distance (TOD) were measured on the 2D US images, and ventricle volumes were manually segmented from 3D US images. Pearson correlation between each index and volume as well as the correlations between the change in each index between adjacent time points and corresponding change in volume were performed.

RESULTS

Strong, significant correlations ($r > 0.80$, $p < 0.05$) were found for all correlations comparing the change in volumes and the change in 2D measurements. Change in HC was the lowest of all the correlations ($r = 0.085$).

CONCLUSION

AHW, 3rd and TOD measurements can be predictive of ventricle volumes, but make poor estimates of changes in volumes of IVH patients.

CLINICAL RELEVANCE/APPLICATION

Neither changes in 2D US measurements, nor changes in HC appear to be related to actual ventricle volume changes. This should be taken into account when reviewing standard cranial US exam.

VSPD21-14 • Doppler Evaluation of Anterior Cerebral Artery in Children on ECMO and Age-matched Controls: Predictive Value in Cerebrovascular Complications

Eman N Alqahtani MBBS (Presenter) ; **Carlos A Zamora** MD, PhD ; **Melania Bembea** ; **Ivor Berkowitz** ; **Kathryn A Carson** ; **Thierry Huisman** MD ; **Aylin Tekes** MD

PURPOSE

Patients on extracorporeal membrane oxygenation (ECMO) are at high risk of cerebrovascular complications (CVC) due to serious underlying diseases, systemic heparinization and sepsis. Our aims were: 1) To evaluate resistive index (RI) measurements in the anterior cerebral artery (ACA) to predict CVC such as intracranial hemorrhage (ICH) and ischemic events in children on ECMO, 2) To evaluate the differences in RI measurements between children on ECMO and age-matched controls, 3) To evaluate clinical variables to predict CVC.

METHOD AND MATERIALS

The institutional review board approved this study. A retrospective chart review of patients

RESULTS

There were a total of 98 children (ECMO $n = 36$, age matched controls $n = 62$). Nine (25%) of the 36 developed CVC (ICH $n = 6$, ischemia $n = 3$). The difference between baseline and compression RI values and percent change on the first day of ECMO was statistically significantly higher for children with CVC compared to no CVC ($p = 0.03$ and $p = 0.02$, respectively). Median percentage change in the RI value was 5.59% in controls. The median percent change was -20%-78% during the period on ECMO in the no CVC group, while the ICH group showed the widest range of RI percent change until the day of CVC (Fig. 1). Of the clinical variables, only age at initiation of ECMO was statistically significantly associated with increased risk of CVC (≥ 2 days ($p = 0.02$)).

CONCLUSION

Children who had ICH had the widest range of percent RI change during the course of ECMO. Minimal RI change can be reassuring for no CVC in children with ECMO. Children younger than 3 days of age at the time of ECMO cannulation are at higher risk for CVC. These results should be validated in larger prospective studies.

CLINICAL RELEVANCE/APPLICATION

We want to understand the role of cerebral autoregulation in patients on ECMO aiming to predict CVC that affect 30-50% of patients on ECMO.

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

Monday, 12:15 PM - 12:45 PM • S101AB

PD

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CL-PDS-MOA • AMA PRA Category 1 Credit™: 0.5

Host
Avrum N Pollock, MD

CL-PDS-MO1A • Diffusion Tensor Imaging of the Cerebellum-prefrontal Area in ADHD Children

Pilar Dies-Suarez MD (Presenter) ; **Eduardo Barragan** ; **Benito De Celis** ; **Silvia Hidalgo** ; **Manuel Obregon** ; **Porfirio Ibanez**

PURPOSE

The attention deficit hyperactivity disorder (ADHD) is one of the most frequent problems that affect children and produce scholar failure and behavioral problems. The principal hypothesis is a dopaminergic dysfunction in the brain. Diffusion tensor imaging (DTI) is an MRI modality that provides information about the direction and integrity of neural fibre tracks in the brain in vivo.

METHOD AND MATERIALS

23 children (ages 7-12 yrs, 11 ADHD patients, 12 controls) were examined. Images were acquired on a 1.5T imager (Philips)

Intra-Achieva). Diffusion Tensor Imaging (DTI) data were acquired using a SE-EPI sequence with: TR/TE = 9491/75 ms, FOV=230x230x140 mm³, voxel size=1.60x1.60x2mm³, slices number= 70, fat suppressed. Diffusion weighted gradients were applied along 15 non-collinear directions with a b-value=800 s/mm². High-resolution images were acquired using 3DT1 Gradient Sequence with the following parameters: TR/TE=25/3.88ms, slice thickness 2mm, and NEX=1. Tractography: The diffusion tensor (DT) was fitted with linear least-square after a preprocessing step correcting for head movements and eddy currents was applied by registering all volumes. Finally, using MedINRI, diffusion tensors were calculated to obtain Fractional Anisotropy (FA) with FA threshold of 0.2 and smoothness factor of 20 out of 100, and Mean Diffusivity values. Segmentation of the cerebellum CB was manually drawn on midline sagittal 3D-T1 images.

RESULTS

We present results of white matter connectivity of tracts connected cerebellum-prefrontal area. There were no discernible ADHD-Control changes in ADC values along the connected white matter (figure 1) while generalized fractional anisotropy is increased ($p=0.08$). Length of tracts vs ADC is shown in figure 2.

CONCLUSION

DTI studies have revealed developmental changes in cortical WM pathways in prefrontal regions and in pathways surrounding the basal ganglia and cerebellum in patients with ADHD, which presumably reflect decreasing myelination of axons.

CLINICAL RELEVANCE/APPLICATION

Affects between 3 to 7% in America Latina, and it's consider a public health problem. We are considering MR imaging to improve the diagnostic on ADHD patients.

CL-PDS-MO2A • Aberrant Whole-brain Functional Connectivity in Children with Chronic Fatigue Syndrome

Fanxing Meng MMed (Presenter) ; **Na Liu** MD ; **Bing Yu** MD ; **Qiyong Guo** MD

PURPOSE

To assess the abnormalities of whole-brain functional connectivity in children with chronic fatigue syndrome (CFS) using resting-state functional magnetic resonance imaging (fMRI).

METHOD AND MATERIALS

Resting state fMRI data were obtained from 65 right-handed children, including 31 CFS children (M/F, 17:14; age, 10.0±1.5 y) and 34 age-matched healthy controls (M/F, 19:15; age, 10.2 ±1.3 y). fMRI scans were performed on a 3.0-T MR scanner and post-processed using REST software. Comparisons of z-score correlation coefficients between distinct cerebral regions were used to identify altered functional connectivity in CFS children. Individual z-scores were compared with two-tailed t-tests to determine the significance of functional connectivities between the two groups. The false discovery rate (FDR) approach was applied to identify the restriction threshold capable of reducing the proportion of type I errors to < 0.05.

RESULTS

A total of 15 significantly different functional connectivities were identified in the medial prefrontal cortex (MPFC), insula, putamen, primary somatosensory cortices (S1), secondary somatosensory cortices (S2), anterior cingulate cortex (ACC) and thalamus between the CFS and control groups at an FDR corrected threshold of P

CONCLUSION

Our findings suggest that abnormalities of functional connectivities between MPFC, insula, somatosensory cortices and ACC are likely to be involved in the onset and progression CFS in children.

CLINICAL RELEVANCE/APPLICATION

Abnormalities of functional connectivities between MPFC, insula, somatosensory cortices and ACC are likely to be involved in the onset and progression CFS in children.

CL-PDS-MO3A • Altered Tryptophan Metabolism and White Matter Development in Cerebellum of Children with Autistic Spectrum Disorders

Jeong-Won Jeong PhD (Presenter) ; **Ajay Kumar** MD, PhD ; **Harry T Chugani** MD ; **Diane C Chugani** PhD *

PURPOSE

METHOD AND MATERIALS

RESULTS

A significant inverse correlation ($R^2=0.46$, $p=0.04$) was found between the LI values of SUV of the dentate nucleus and FA of the DRP (Fig. 1 a). Increased tryptophan metabolism in the dentate nucleus was correlated with reduced axonal microstructural integrity of the ipsilateral efferent pathway (Fig. 1 b). Furthermore, the LI values for both SUV and FA were significantly correlated with the scores of daily living skills; higher SUV and lower FA were related to lower scores (Table 1).

CONCLUSION

The present study shows that unilateral disturbance in tryptophan metabolism is associated with unilateral change in white matter integrity in the dentate nucleus efferent pathway (i.e., DRP) and deficits in daily living skills in children with ASD. Increased tryptophan metabolism may represent increased serotonin synthesis or increased metabolism by the immune factor activated kynurenine pathway.

CLINICAL RELEVANCE/APPLICATION

The findings of the present study provide a better understanding of the possible pathogenesis in the dentate nuclei and its efferent pathway, DRP, and its role in children with ASD.

CL-PDS-MO4A • Apparent Diffusion Coefficient Histograms in Medulloblastoma Subtypes

Korgun Koral MD (Presenter) ; **Youngseob Seo** PhD ; **Lynn Gargan** PhD ; **Derek Mathis** MD ; **Linda Margraf** MD ; **Zhiyue J Wang** PhD

PURPOSE

To test whether apparent diffusion coefficient (ADC) histograms allow for preoperative diagnosis of medulloblastoma subtypes.

METHOD AND MATERIALS

Retrospective review of Neuro-Oncology database yielded 29 patients (23 male) with medulloblastoma. The pathology specimens were re-evaluated and subcategorized according to the latest WHO classification of the central nervous system tumors. There were 19 classic, 8 desmoplastic/ nodular and 2 large cell medulloblastomas. All patients had preoperative MR imaging performed at a single institution. Diffusion weighted imaging was performed using a spin echo sequence with $b=0$ and $b=1000$ s/mm². ADC maps were generated with a monoexponential fit on a voxel-to-voxel basis for all imaging planes. Internally developed software written in IDL was used for data analysis. T2 weighted and contrast enhanced T1 weighted images were displayed together with ADC map to help visualize the tumor volume. A pediatric neuroradiologist, blinded to the subcategorization, traced the tumor boundaries at as many levels as possible. The ADC histograms for voxels within the ROI were obtained with a bin size of 0.02×10^6 mm²/s and normalized by the total number of voxels. The average histogram for each subtype was calculated. Peak height, mean ADC, 10th percentile, 25th percentile, 50th percentile, 75th percentile and 90th percentile points, and skewness were computed.

RESULTS

The average histogram for each subtype showed significant overlap with other subtypes which did not allow for discrimination. The 10th

percentile, 25th percentile, 50th percentile, 75th percentile and 90th percentile points, and skewness were not significantly different among subtypes.

CONCLUSION

Although utility of ADC histogram analysis was previously shown in preoperative diagnosis of pediatric cerebellar tumors, this method did not prove useful in preoperative discrimination of medulloblastoma subtypes.

CLINICAL RELEVANCE/APPLICATION

ADC histogram analysis is not useful in preoperative discrimination of medulloblastoma subtypes.

CL-PDS-MO5A • Repetitive MR Measurements of Lung Volume in Fetuses with Congenital Diaphragmatic Hernia: Individual Development of Pulmonary Hypoplasia during Pregnancy with Calculation of Weekly Lung Growth Rates

Claudia Hagelstein MD (Presenter) ; Meike Weidner ; Angelika Debus MD ; Anna Walleyo ; Stefan O Schoenberg MD, PhD * ; Thomas Schaible ; Karen Busing ; Wolfgang Neff MD, PhD

PURPOSE

To investigate individual changes in fetal lung volume (FLV) in fetuses with congenital diaphragmatic hernia (CDH) and to calculate weekly growth rates of the FLV using serial MR examinations during pregnancy.

METHOD AND MATERIALS

The study received approval from the institutional review board. MR-FLV was measured in 89 fetuses with CDH between 19 and 39 weeks gestation using T2-weighted HASTE imaging. All fetuses received two MR examinations with at least four weeks in between. In addition to the absolute MR-FLV (aMR-FLV) and the observed-to-expected MR-FLV (o/e MR-FLV) a weekly growth rate of the aMR-FLV was determined for each fetus.

RESULTS

In 98% of all fetuses (87/89) the aMR-FLV increased between the two examinations (mean increase 11.1 ml, range 1.5-37.7 ml). Mean o/e MR-FLV at the first MRI (mean 26.0±3.1 weeks gestation) was 33.3±12.2% (range 10.5-79.1%) and 29.5±10.9% (range 10.8-63.7%) at the second MRI (mean 33.9±2.4 weeks gestation). 61% of the fetuses (54/89) showed a decrease of the o/e MR-FLV during pregnancy (mean decrease 9.4%, range 2.2-31.7%). In 26% of all fetuses (23/89) the o/e MR-FLV increased (mean increase 7.7%, range 2.2-26.2%) and 13% (12/89) revealed stable values. Both, first and second o/e MR-FLV, were significantly associated with neonatal outcome. Measuring o/e MR-FLV near delivery was of superior prognostic value than earlier measurements (mortality: AUC=0.844 vs. AUC=0.778; extracorporeal membrane oxygenation (ECMO) requirement: AUC=0.852 vs. AUC=0.768). The mean lung growth rate in CDH-fetuses between the two MR examinations was 1.3±0.8 ml per week, compared to a mean weekly growth rate of 5.3±0.8 ml in healthy fetuses for the identical periods of time. On average, the weekly growth rate of FLV in fetuses with CDH was only 26% of the growth rate in healthy fetuses.

CONCLUSION

Fetuses with CDH do not only have lower FLVs but also have lower weekly lung growth rates compared to healthy fetuses. Individual development of FLV in CDH-patients during pregnancy is extremely variable with decreasing, stable and increasing o/e MR-FLVs. In selected cases, the o/e MR-FLV relatively changed by more than 80% during pregnancy.

CLINICAL RELEVANCE/APPLICATION

Due to the variable individual development of FLV in CDH-patients during pregnancy, follow-up MR-FLV measurements are advisable prior to decision-making about pre- and postnatal therapeutic options.

CL-PDE-MO6A • Perianal Disease in Paediatric Crohn's Patients: Pelvic MRI versus MRE

Mary-Louise C Greer MBBS, FRANZCR (Presenter) ; Ryan T Lo ; Zehour E Alsabban MBBS ; Peter Church ; Rahim Moineddin ; Thomas Walters ; Jacob C Langer ; Anne Griffiths

PURPOSE/AIM

The aims of this exhibit are: 1. To demonstrate the spectrum of perianal disease in paediatric Crohn's patients on pelvic MRI. 2. To describe imaging techniques optimizing pelvic MRI in children with perianal disease, and standard magnetic resonance enterography (MRE) technique perianal region coverage. 3. To compare perianal disease seen on both pelvic MRI and MRE, highlighting benefits and pitfalls of both techniques.

CONTENT ORGANIZATION

Epidemiology: paediatric Crohn's disease and subset of perianal disease. Anatomy and pathophysiology: review of anorectal anatomy and perianal fistula classification. Imaging techniques: pelvic MRI including schematic of imaging planes; standard MRE and specific attention to perianal region coverage. Case examples: spectrum of disease on pelvic MRI, comparison of pelvic MRI and MRE perianal disease in the same patient. Benefits and limits: role and implications of both techniques in screening and management.

SUMMARY

The major teaching points are: 1. Pelvic MRI is the gold standard for detecting and classifying perianal disease in children with Crohn's disease, as well as in adults. 2. MRE has a complementary role to pelvic MRI in detecting perianal disease. 3. The perianal region should be a review area in MRE evaluation, in addition to small bowel, in paediatric Crohn's patients.

CL-PDE-MO7A • Magnetic Resonance Imaging of the Temporomandibular Joint in Juvenile Idiopathic Arthritis and Other Pediatric Rheumatologic Diseases

Floyd D Dunnavant MD (Presenter) ; Saurabh Guleria MD ; Yoginder N Vaid MD ; Daniel W Young MD ; Stuart A Royal MS, MD ; Randy Q Cron * ; Matthew L Stoll

PURPOSE/AIM

Juvenile idiopathic arthritis (JIA) is the most common cause of chronic arthritis in children. The temporomandibular joint (TMJ) is frequently involved in JIA, with multiple associated complications, yet TMJ involvement remains one of the most underdiagnosed conditions in JIA. TMJ involvement can also be seen less frequently in other rheumatologic diseases. MRI with contrast is considered the gold standard for TMJ evaluation. The purpose of this exhibit is to show the spectrum of pathological changes by MRI of TMJ involvement in JIA and other rheumatologic diseases.

CONTENT ORGANIZATION

This exhibit will demonstrate typical examples of the pathologic findings of TMJ involvement in JIA obtained at 3T MRI of children at our institution. Findings include synovial enhancement, joint effusion, pannus formation, deformed or displaced disc, bone marrow edema, condylar head flattening, erosions, and osseous destruction. Normal comparisons and CT correlations will be demonstrated. TMJ involvement in other rheumatologic diseases will also be shown.

SUMMARY

Relatively little has been published about TMJ involvement in JIA, and imaging remains underutilized at many large pediatric centers. Routine MRI screening of the TMJ has been recommended. This presentation will demonstrate the findings typical of TMJ involvement in JIA and other rheumatologic diseases.

PD

CL-PDS-MOB • AMA PRA Category 1 Credit™:0.5

CL-PDS-MO1B • MRI Resting State Studies in ADHD Infants and the Role of the Posterior Cingulate Cortex**Pilar Dies-Suarez MD (Presenter) ; Eduardo Barragan ; Silvia Hidalgo ; Benito De Celis ; Manuel Obregon ; Porfirio Ibanez****PURPOSE**

ADHD is a neurological disorder in children with prevalence circa 5%. This illness is considered to be in an 80% originated by genetic factors. Most work on magnetic resonance resting states has been performed in Asia, Europe and North America, but little work exist exclusively on the Latin genetic pool. Here we compared infant Latin ADHD patients with healthy ones. We discuss the differences with previous studies that used different genetic pools.

METHOD AND MATERIALS

30 volunteers (8.4±2 years, both sexes) were divided in two groups, healthy (H) and ADHA (AD). Volunteers laid in an MR scanner in silence while 150 brain volumes covering the whole of the brain were acquired. Resting state analysis was performed using DPARSF software. Low frequencies under 0.08 Hz were kept. Regions of homogeneous variance (ReHo) and amplitude of the low frequencies (Alff) were calculated. Data was threshold at p

RESULTS

Figure 1A and 1B present the results of a comparison of between H and AD patients (H>AD in green and AD>H in red). H subjects presented strong left lateralization (80% vs. 20% structures). AD patients presented a stronger right lateralization (55% vs. 45%).

CONCLUSION

AD patients had a larger predominance of right hemisphere activations over left in contrast to healthy subjects. Previous work has reported strong involvement of the brain stem and the anterior cingulate gyrus for AD patients compared to H which we did not find. Never reported correlations with the frontal gyrus and the posterior cingulate cortex were found. Considering that similar analysis methods were followed as in previous studies, we believe that the differences shown arise by the different genetic origin of volunteers.

CLINICAL RELEVANCE/APPLICATION

provide to the clinical neurologist, the degree of injury in patients with TDH by image analysis resting state

CL-PDS-MO2B • Multi Detector Computed Tomography (MDCT) Assessment of Tracheobronchomalacia (TBM) in Children: A Comparison with Bronchoscopic Findings and the Severity of Air Trapping-A Preliminary Retrospective Study**Ambereen Ahmed MD, MSc (Presenter) ; Jim Carmicheal MBBS, FRCR****PURPOSE**

The purpose of this project was to retrospectively compare MDCT with bronchoscopy to assess Tracheobronchomalacia by correlating the site and degree of severity of air trapping with the extent of TBM.

METHOD AND MATERIALS**MATERIAL AND METHODS STUDY POPULATION**

The retrospective cohort with TBM had 21 participants and control group 17 patients between the ages of (0-18 years). Rate and severity of air trapping was assessed from end expiratory MDCT images using an established scoring system by two blinded paediatric radiologists. MDCT airway diameter was defined, and percentage change in diameter between end-inspiration/end-expiration was measured. The severity of air trapping between the groups was assessed by independent sample t-test. RECORDING OF DATA. The data was recorded on Microsoft excel spread sheets.

STATISTICS ANALYSIS

Statistical analysis was performed using SPSS version 19.0 software.

- ◆ Agreement between MDCT and bronchoscopic measurements was assessed using Bland-Altman statistics.
- ◆ Correlations between MDCT airway diameter and air trapping score was obtained using Spearman Rank Correlation.
- ◆ A correlation between MDCT cross-sectional area and air trapping score was obtained using Spearman Rank.
- ◆ Correlation differences in measures between TBM patients and controls in group 2 without the TBM was assessed using Mann-Whitney U test.

A p value of

RESULTS

Results: The demographics of TBM group and the control group were (13 males, 8 females) mean age 29 months and (12 males, 5 females) with the mean age of 33 months respectively. Differences in severity of total air trapping between the groups and the patterns of air trapping between the two groups was not statistically significant (.78) and (P=.05) respectively.

CONCLUSION

Paediatric population with TBM does not incur a higher frequency and severity of air trapping opposed to the children without this disease. The Retrospective nature of the study prevented us from controlling all the variables. Another drawback was there is no validated classification for diagnosis of TBM. The symptomatic presentation of TBM is non-specific and could be easily missed on routine imaging studies.

CLINICAL RELEVANCE/APPLICATION

(Dealing with MDCT) 'Dynamic 64- MDCT is equal to Bronchoscopy in detecting TBM but superior in detecting a higher frequency and severity of air trappings in children and is recommended.

CL-PDS-MO3B • Patterns of Brain Morphological Changes in Children Patients with Type I Gaucher Disease**Huiying Kang (Presenter) ; Hua Cheng MD ; Bin Gu ; Gaolang Gong ; Yun Peng MD****PURPOSE**

Gaucher disease is the most prevalent inherited lysosomal storage disorder resulting from deficiency of the lysosomal enzyme glucocerebrosidase. The overall incidence is approximately 1:40,000 individuals. Although classic type I gaucher disease (GDI) is defined as non-neuropathologic involved, increasing clinical studies revealed that there are over 30% GDI patients suffering at least one neurological symptom. Our current study aims to investigate if there are any significant morphological brain changes in GDI patients, using voxel-based morphometry (VBM).

METHOD AND MATERIALS

19 GDI children patients and 16 normal children were recruited in this study. All patients were evaluated by the severity scoring tool (SST) to quantify the measurement scale about CNS involvement. All normal children had no history of neurological or psychiatric illness. MR images were scanned using a 3T clinical scanner. Voxel-based morphometry of high-resolution T1-weighted MR images, processed using VBM8 toolbox in SPM. To detect the group difference of GMV and WMV between GDI patients and controls, a general linear model were applied to all voxels across the entire gray matter or white matter, after controlling for age, gender and whole brain volume. Statistical significance was determined by a cluster extent threshold of p

RESULTS

9 of 19 patients show different degrees of the CNS involvement by the severity scoring tool (SST). When compared with healthy controls, significant decrease of GMV in GDI patients was found in the right precentral gyrus and left parahippocampal gyri. In contrast, left cerebellum showed a significant increase of WMV. No significant increase of GMV or significant decrease in WMV in GDI patients relative

to healthy controls.(supplementary Figure)

CONCLUSION

This preliminary study provides novel evidences for structural abnormalities in GDI patients, suggesting a necessity of adjusting the opinion regarding the CNS-involvement of GDI.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest that VBM analysis is a potential imaging marker in clinical studies of GDI.

CL-PDS-MO5B • ADCratios Allow for Correct Preoperative Diagnosis of Common Pediatric Cerebellar Tumors with High Accuracy Across Institutions

Nabila Choudhury MD (Presenter) ; Mahmud Mossa-Basha MD ; Song Zhang PhD ; Barjor Gimi PhD ; Ang Gao MS ; Lynn Gargan PhD ; Daniel C Bowers MD ; Izlem Izbudak MD ; Korgun Koral MD

PURPOSE

To test the accuracy and applicability of decision rules utilizing ADC_{ratios} and age on the accurate preoperative diagnosis of common pediatric cerebellar tumors across institutions.

METHOD AND MATERIALS

This study was performed at 2 institutions employing different MR scanners. There were 142 pediatric cerebellar tumors. At Site 1, a blinded reviewer placed 3 ROIs on solid components of 98 tumors and normal brain (normal appearing cerebellum and thalamus) on ADC maps. ADC_{ratios} were calculated using umoral ADC_{mean} and cerebellar ADC values. ROC analysis was performed to obtain useful thresholds to discriminate pilocytic astrocytomas (PA), ependymomas and embryonal tumors (medulloblastomas and atypical teratoid rhabdoid tumors [ATRT]). Utility of these thresholds were tested using ADC_{ratios} obtained from 44 pediatric cerebellar tumors at Site 2 where ADC measurements of the cerebellar tumors and normal brain were performed using the same method employed at Site 1. The utility of age was tested to discriminate medulloblastomas from atypical teratoid/ rhabdoid tumors.

RESULTS

ADC values of normal brain at Site 1 were significantly different from the ADC values obtained at Site 2. ADC_{mean} of pilocytic astrocytomas were different at Site 1 and Site 2; and ADC_{mean} of embryonal tumors were different at Site and Site 2. The ADC_{ratios} were not significantly different for pilocytic astrocytomas, ependymomas and embryonal tumors at Site 1 and Site 2. ADC_{ratio} of =1.7 was chosen to discriminate pilocytic astrocytomas. 51(91.43%) PAs were correctly diagnosed (32/35 at Site 1; 18/19 at Site 2). ADC_{ratio} of

CONCLUSION

ADC_{ratios} can be reliably used to discriminate common pediatric cerebellar tumors across institutions. Age 2 years is a highly accurate discriminator among embryonal tumors.

CLINICAL RELEVANCE/APPLICATION

ADC_{ratios} can be reliably used to discriminate common pediatric cerebellar tumors across institutions and scanner. Age 2 years is a highly accurate discriminator among embryonal tumors.

CL-PDE-MO6B • State-of-the-Art MR Enterography in Pediatric Inflammatory Bowel Disease

Rakhee H Goel MD (Presenter) ; Ellen Park MD, MS ; Neil Vachhani MD ; Alex C Wu MD ; Unni K Udayasankar MD, FRCR

PURPOSE/AIM

Discuss role of state-of-the-art MR enterography (MRE) in pediatric inflammatory bowel disease (IBD) with emphasis on: 1. Newer imaging techniques

2. Improving quality of MRE in the pediatric population
3. Imaging in decision making for diagnosis, management and assessing treatment effect

CONTENT ORGANIZATION

Describe improved imaging techniques in pediatric IBD

- 3T vs 1.5T
- Faster sequences
- Optimal fat suppression: SPAIR
- Diffusion weighted imaging
- Motion correction algorithms
- Routine use of glucagon
- Post contrast subtraction imaging

Illustrate improved MRE findings of pediatric IBD with newer techniques with special emphasis on:

- Lesion detection
- Differentiating active inflammatory process from chronic fibrotic disease
- Guide therapy
- Evaluate complications
- Assess treatment effect

Provide an easy to use flow chart for evaluating children with IBD

SUMMARY

MRE plays a key role in evaluation of children with IBD and has replaced CT as the primary imaging technique of choice. Technical improvements as illustrated in this exhibit vastly enhance our ability to identify and characterize inflammatory process as well as complications in pediatric IBD.

CL-PDE-MO7B • Algorithmic Approach to Pediatric Rheumatologic Emergencies

Erhan Akpınar MD ; Osman M Topcuoglu MD (Presenter) ; Nursun Ozcan ; Berna Sayan Oguz MD ; Mithat Haliloglu MD

PURPOSE/AIM

1. To emphasize the diagnostic imaging findings of pediatric rheumatologic emergencies. 2. To identify the basic imaging clues for chronic arthritis, connective tissue diseases and systemic vasculitis in pediatric age group. 3. To discuss the major complications of pediatric rheumatic diseases with illustrative cases.

CONTENT ORGANIZATION

1. Epidemiology and overview of pediatric rheumatologic emergencies
2. Radiologic investigation of pediatric rheumatic diseases(X-ray, CT, MRI)
3. Imaging algorithm and differential diagnosis in common emergencies in patient with rheumatic diseases:
 - a. The child with respiratory distress and renal failure
 - b. The child with pericardial tamponade
 - c. The febrile child with pancytopenia
4. Conclusion

SUMMARY

The course of rheumatologic disease in pediatric age group and imaging findings have somewhat differences from adults. The three major subgroup of disease will be discussed along with the X-ray, CT, and MR imaging findings. Emergency conditions such as acute respiratory distress, acute thrombosis of main vascular structures and aneurysms that can be seen in the course of pediatric rheumatologic diseases

will be described with representative cases. Radiologist who read this exhibit will be able to recognize basic clues of pediatric rheumatologic disease and decide which condition is emergency.

CL-PDE3026-MOB • Rediscovering Transthoracic Chest Ultrasonography in Children: Practicing Alara Principle

Marcelo A Rocha (Presenter) ; **Yoshino T Sameshima MD** ; **Erika T Koshimura** ; **Eliane E Dutenehner MD, BDS** ; **Martha Hanemann Kim** ; **Flavia Faganello Gasparini** ; **Maysa d Ferreira BARCH** ; **Miguel J Francisco Neto MD** ; **Marcelo B Funari MD**

PURPOSE/AIM

To illustrate normal/abnormal imaging patterns and several pleuropulmonary diseases in children through transthoracic chest ultrasonography, and its correlation to other imaging methods;
To review in a simple and direct topic format important daily practice guidelines and imaging signs to perform state-of-the-art transthoracic chest ultrasonography;
To emphasize the method's contribution to reducing ionizing radiation dose delivered to neonates and children (ALARA principle).

CONTENT ORGANIZATION

Presentation of the sonographic ♦pleuropulmonary lines♦;
Sonographic patterns of pulmonary aeration;
Important signs in transthoracic chest ultrasonography;
Sonographic classification of pneumonia and pleural effusion;
Other applications of pediatric transthoracic chest ultrasonography.

SUMMARY

Take home messages:

Normal and abnormal pulmonary aeration status can be evaluated by sonographic pulmonary patterns;
Fluid color sign finding gives high specificity in detecting small pleural effusions;
Sonographic classification of pneumonia based on color Doppler findings have high correlation with length of stay;
Transthoracic chest ultrasonography has a wide range of applicability, such as in complicated pneumonia follow-up instead of chest CT, reducing the ionizing radiation exposure of pediatric patients respecting ALARA principle.

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.

Mentored Case Approach to Pediatric Cardiovascular Disease 2: Cardiac Disease (An Interactive Session)

Tuesday, 08:30 AM - 10:00 AM • S402AB



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RC324 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

S. Bruce Greenberg, MD

Director

Rajesh Krishnamurthy, MD *

Rajesh Krishnamurthy, MD *

Frandics P Chan, MD, PhD *

Lauren M Sena, MD

LEARNING OBJECTIVES

1) Understand the morphology, treatment, and long term complications of treated and untreated congenital heart disease via an interactive mentored-case approach with audience response system. 2) Highlight appropriateness of MRI and CT with regard to technique, pitfalls, indications and critical imaging findings that affect management for common imaging scenarios, including conotruncal anomalies, single ventricle, cardiomyopathy and myocarditis. 3) Provide an opportunity for general radiologists, pediatric radiologists and cardiac imagers who have limited exposure to this area in their workplace an opportunity to refresh their pediatric cardiovascular imaging skills in a focused manner.

Pediatric Radiology Series: Chest/Cardiovascular Imaging I

Tuesday, 08:30 AM - 12:00 PM • S102AB



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VSPD31 • AMA PRA Category 1 Credit™:3.25 • ARRT Category A+ Credit:3.5

Moderator

Shreyas S Vasanawala, MD, PhD *

Moderator

Taylor Chung, MD

Moderator

Daniel W Young, MD

VSPD31-01 • State of the Art MRI and MRI of Congenital Heart Disease

Frandics P Chan MD, PhD (Presenter) *

LEARNING OBJECTIVES

- 1) To review the MRI environment and anesthesia requirements for pediatric patients with congenital heart disease.
- 2) To understand what MRI can do that echocardiography or catheter angiography cannot, and how this is used to advantage in congenital heart disease.
- 3) To explore advanced techniques, such as four-dimensional phase contrast imaging, real-time imaging, and non-contrast coronary angiography, that can expedite and increase the capability of cardiac MRI studies.

ABSTRACT

Cardiac MRI is an established imaging tool for the assessment of congenital heart disease in children and adults. The lack of oncogenic radiation makes MRI the preferred tool over CT. However, in young patients who require general anesthesia, the imager should be familiar with the risks involved. While usually safe, general anesthesia has heightened risk in patients with aortic obstruction, pulmonary hypertension, arrhythmia, and ventricular failure. In current clinical practice, the three-dimensional capability of cardiac MRI is used to accurately assess ventricular volume and function. Flow measurement by two-dimensional phase contrast is used to assess shunt ratio, cardiac output, and valvular regurgitation. Comprehensive cardiac MRI examination for a patient with complex congenital heart disease can be time-consuming, and it requires an MRI operator with considerable skill and knowledge of cardiac anatomy. Four-dimensional phase contrast imaging capture a volume of the cardiac anatomy and flow physiology, which can be analyzed by post-processing, thereby simplifying the scan protocol and shortening the study time. Other advanced MRI techniques include real-time and pseudo-gated imaging for fetal studies, delayed-enhancement of myocardium for endocardial fibroelastosis, and MR coronary angiography for coronary anomalies.

VSPD31-02 • Clinical Validation of Free Breathing Navigator Triggered Retrospectively Cardiac Gated Cine Steady-state Free Precession (NAV-SSFP) Imaging in Sedated Children

Lamya A Atweh MD (Presenter) ; Amol Pednekar PhD * ; Siddharth P Jadhav MD ; Esben S Vogelius MD ; Raja Muthupillai PhD * ; Rajesh Krishnamurthy MD *

PURPOSE

The cine steady-state free precession (SSFP) is the preferred sequence for ventricular function evaluation, however it requires suspended respiration which is difficult in sedated children. Many groups perform multi-NSA acquisitions (MN) during free breathing. In this work, we validate a navigator triggered SSFP (NAV-SSFP) sequence that drives the magnetization to steady-state before cardiac gated cine acquisition in the sedated free-breathing pediatric population.

METHOD AND MATERIALS

This prospective study was performed with IRB approval on 20 sedated children with congenital heart disease (age: 7 ± 6 yrs, HR: 97 ± 22 bpm, RespR: 22 ± 9 bpm). The cine SSFP sequence was modified to include respiratory triggering with Navigator [1]. Imaging was performed on a 1.5T MR scanner. Identical imaging parameters were used for MN (4 NSA) and NAV sequences, covering both ventricles in short-axis orientation (TR/TE/flip angle: $3/1.5/60^\circ$; acquired voxel size: $1.3\text{-}1.6 \times 1.3\text{-}1.8 \times 4\text{-}9.5$ mm³; SENSE acceleration factor: 2; temporal resolution: 30-45 ms). Image quality assessment (Figure 1) and quantitative volumetric analysis was performed by a single blinded user. One-sided Wilcoxon signed rank test and Box plot analysis were performed to compare the clinical scores. Bland-Altman (BA) analysis was performed on LV and RV volumes.

RESULTS

The clinical scores for NAV-SSFP were consistently better than MN-SSFP (Table 1). Total score with equal weights to each clinical score category was significantly better for NAV compared to MN. EDef scores were significantly better for NAV-SSFP than MN-SSFP. ISA scores were identical. The BMC scores were not significantly different. BA analysis for LV volumes indicates that variability between NAV and MN acquisitions is comparable to inter and intra-observer variability reported in the literature (Table 2) [2]. Total scan duration for NAV-SSFP (4.1 ± 1.6 min) was shorter than MN-SSFP (5.2 ± 0.8 min).

CONCLUSION

Modifying the cardiac gated cine SSFP sequence for free-breathing and navigator triggering allows clinically diagnostic images in sedated patients without penalty for contrast, spatio-temporal resolution, or total scan time while significantly decreasing RF duty cycle and improving spatial detail. 1 ISMRM 3938, 2012 2 JMRI 28(39-50), 2008

CLINICAL RELEVANCE/APPLICATION

Free-breathing navigator triggered cine SSFP allows diagnostic images in sedated patients with improved spatial resolution and shorter scan times.

VSPD31-03 • Noninvasive 4D Pressure Difference Mapping Derived from 4D Flow MRI in Patients with Repaired Aortic Coarctation: Comparison with Young Healthy Volunteers

Fabian Rengier MD (Presenter) ; Michael Delles DiplEng ; Joachim Eichhorn MD ; Hendrik Von Tengg-Kobligh MD * ; Hans-Ulrich Kauczor MD * ; Roland Unterhinninghofen PhD ; Sebastian Ley MD

PURPOSE

In patients with aortic coarctation, pressure measurements before and after repair currently are obtained by invasive catheterization or by echocardiography using the Bernoulli equation. Purpose of this study was to assess spatial and temporal pressure changes in patients with repaired aortic coarctation compared to young healthy volunteers using 4D flow MRI and derived 4D pressure difference maps.

METHOD AND MATERIALS

4D flow MRI of the thoracic aorta was performed at 1.5T in 13 patients after aortic coarctation repair without recoarctation (mean age 18.8 years, 5 female, 8 male) and 13 healthy volunteers (mean age 22.9 years, 4 female, 9 male). Spatial/temporal resolution was $1.6 \times 1.6 \times 2.1$ mm³/28ms. Using published algorithms and in-house developed image processing software, 4D pressure difference maps relative to the proximal ascending aorta were computed based on the Navier-Stokes equation. The thoracic aorta was divided into four segments: ascending aorta, aortic arch, proximal descending aorta and distal descending aorta. For each segment, spatial pressure range at mid systole and maximum slope of local pressure amplitudes were calculated.

RESULTS

Mean spatial pressure range at mid systole for patients/volunteers was (in mmHg): ascending aorta 1.8/1.6 ($p=ns$), arch 4.8/1.7 ($p=0.02$), proximal descending 8.9/1.6 (p

CONCLUSION

Noninvasive 4D pressure difference mapping derived from 4D flow MRI showed significant spatial and temporal changes in patients with repaired aortic coarctation compared to young healthy volunteers, particularly affecting aortic arch and proximal descending aorta, but also distal descending aorta. The technique can characterize such changes not only noninvasively but also in greater detail than echocardiographic pressure gradient measurements.

CLINICAL RELEVANCE/APPLICATION

4D pressure difference mapping can characterize spatial and temporal changes of intraluminal aortic pressure and may evolve into a noninvasive alternative to catheterization in coarctation follow-up.

VSPD31-04 • Assessment of Conduit Size prior to Percutaneous Pulmonary Valve Replacement: Which MR Sequence Is Best?

Ladonna J Malone MD (Presenter) ; Jane Gralla ; Uyen Truong ; Brian Fonseca ; Thomas Fagan MD ; Lorna Browne MD, FRCP

PURPOSE

The advent of percutaneous pulmonary valve replacement (PVR), providing a nonsurgical approach to the management of severe pulmonary regurgitation in patients with right ventricle to pulmonary artery (RV-PA) conduits, has transformed treatment of patients with repaired congenital heart disease. Cardiac MRI (CMR) is increasingly relied upon to determine candidacy for percutaneous PVR using angiographic size criteria. In order to optimize the CMR assessment, our goal was to determine which pulse sequence had the best agreement with conventional angiographic measurement of the right ventricle to pulmonary artery (RV-PA) conduit obtained during percutaneous PVR.

METHOD AND MATERIALS

15 patients had CMR performed prior to percutaneous PVR procedure. Measurements of the narrowest diameter of the RV-PA conduit were obtained on the following sequences: cine gradient echo (GE) at end-systole and at end-diastole, T1 TSE obtained in systole, 3D gadolinium enhanced MRA, and 3D SSFP. Multiplanar reformats using 3D reconstruction software were used to measure both AP and transverse dimensions on 3D sequences, but only AP diameters if an RVOT plane was obtained (cine GE and T1 TSE). These were compared to angiographic measurements using Bland Altman plots and Intraclass Correlation Coefficient (ICC).

RESULTS

Cine GE measurements at end-systole had the best agreement with angiogram with a mean difference of 0.8 mm (95% limits of agreement -3.86 to 5.46 and ICC 0.75). The AP dimension on 3D MRA also had a high ICC (0.85) and a relatively narrow 95% limits of agreement (-0.89-5.67), but demonstrated a consistent over-measurement bias with a mean difference from angiogram of 2.39 mm. The 3D SSFP measurements demonstrated the worst agreement, likely due to inherent artifacts in stenosed conduits. Slow flow artifact on T1 TSE impaired accurate measurement in irregularly calcified conduits.

CONCLUSION

RV-PA conduit measurements obtained from cine GE at end-systole and 3D MRA demonstrate strongest agreement with conventional angiographic measurements in evaluating percutaneous PVR candidacy.

CLINICAL RELEVANCE/APPLICATION

Standardization of RV-PA conduit measurements with improved angiographic agreement should decrease incidence of unsuccessful percutaneous PVR procedures related to failure to meet size criteria.

VSPD31-05 • Noninvasive Quantification of Aortopulmonary Collateral Flow and Intracardiac Shunt Flow for the Patients who Underwent Bidirectional Glenn Shunting

Rongpin Wang MD (Presenter) ; Qiping Deng MD ; Meiping Huang MD

PURPOSE

To explore the feasibility of calculating aortopulmonary collateral flow (APCF) and intracardiac shunt flow (ICSF) in patients underwent bidirectional Glenn shunt (BGS) by using phase-contrast MRI (PC-MRI) sequence.

METHOD AND MATERIALS

Twenty-two BGS patients (patient group) and 15 healthy volunteers (control group) were performed at 3.0 tesla MR system by using PC-MRI sequence to measure the flow of great vessels of right pulmonary artery (RPA), left pulmonary artery (LPA), ascending aorta (AA), superior vena cava (SVC) and inferior vena cava (IVC). The quantity of AA (Q_A), pulmonary (Q_P) and venous return (Q_V) per minute were calculated by using Report Card software. APCF and ICSF was calculated as the formula: $APCF = Q_S - Q_V$, $ICSF = 2Q_S - (Q_V + Q_P)$. The end-diastolic volume index (EDVI) of major ventricle were performed with cine-MRI sequence, and the regurgitation area of atrioventricular valve were measured with ultrasound cardiography. The difference of Q_P , Q_S and Q_V and blood flow of great vessels intragroup were assessed by using paired samples *t*-test. The relationship of ICSF with EDVI of major ventricle and with the regurgitation area of atrioventricular valve was evaluated with correlation and regression analysis.

RESULTS

In control group, Q_P : Q_S : Q_V were found to be 1: 1.009: 0.974. In patient group, Q_S was found significantly higher than Q_V , and Q_V was significantly higher than Q_P . The blood flow of great vessels in patient group were found to be significantly lower than that of in control group except the flow of AA, while the regurgitation fraction of great vessels in patient group were found to be significantly higher than that of in control group. The APCF ranged from 0.23 to 1.63 l/min/m² (mean 0.88 l/min/m²), and the ICSF ranged from 0.22 to 1.29 l/min/m² (mean 0.61 l/min/m²). A positive relationship between ICSF and EDVI and the regurgitation area of atrioventricular valve were found ($r=0.685$, and $r=0.806$).

CONCLUSION

The parameters of blood flow of great vessels can be reliably measured with PC-MRI sequence on 3.0 tesla MR system. And then, the SPCF and ICSF can be calculated.

CLINICAL RELEVANCE/APPLICATION

The APCF and ICSF can be calculated simultaneously in BGS patients by using phase-contrast MRI sequence, which may play an important role for therapeutic decision-making and evaluating prognosis.

VSPD31-06 • Evaluation of the Pulmonary Vasculature in Mouse Models of Congenital Diaphragmatic Hernias

Michael Phillips ; Daku Siewe BS (Presenter) ; Joshua C Tan ; Scott Moore ; Sean McLean ; Yueh Z Lee MD, PhD *

PURPOSE

Congenital diaphragmatic hernia (CDH) is a common birth defect that leads to pulmonary hypertension. Decreased arterial development in the lung contributes to the pulmonary hypertension observed in CDH. The Slit3 knockout mouse is a viable mouse model for CDH that develops pulmonary hypertension (PHtn). We sought to quantitatively assess pulmonary artery blood vessel development using specimen CT scanning of the perfused pulmonary vasculature of mouse models of CDH.

METHOD AND MATERIALS

We perfused the pulmonary vasculature of 3 month old Slit3 wild type mice (no hernia) to Slit 3 knock mice (CDH/PHtn) using a radio-opaque material (microfil) with density tailored to minimize venous contamination. Vessel overfill was determined through examination by microscope. The mouse lungs with the filled vasculature were excised and scanned on a specimen scanner (Scanco microCT 40) at 8 micron resolution. The data was transferred for offline analysis using iNtuition (Terarecon). Vessel branching, length and diameter were measured.

RESULTS

5 wildtype (Slit3) and 5 CDH (Slit3 KO) were scanned. Severe hypoplasia was evident in the lungs from the CDH mice. Total lung volume was decreased in the knockout mice, consistent with the presence of a CDH. Vessel overfill The pulmonary vasculature was also altered, reflecting the abnormal development. Branch by branch vessel quantitation analysis is ongoing.

CONCLUSION

Quantitative analysis of pulmonary vasculature specimens from mice is readily feasible, providing a powerful new tool for the evaluation of mouse models of disease that effect the lung and lung development. We hope to combine our novel methods of in-vivo and ex-vivo imaging of these mouse models of CDH to add to the armamentum of pediatric radiologists. Though the imaging and analysis approaches are demonstrated in mice, the techniques may be readily translatable to clinically relevant imaging.

CLINICAL RELEVANCE/APPLICATION

Quantitative measures of the pulmonary vasculature are possible in mouse models of CDH, enabling a powerful tool for the evaluation of treatment effects that may be translated into children with CDH.

VSPD31-07 • High Temporal versus High Spatial Resolution in MR Quantitative Pulmonary Perfusion Imaging of 2-year Old Children after Congenital Diaphragmatic Hernia Repair

Meike Weidner (Presenter) ; **Frank G Zoellner** ; **Claudia Hagelstein MD** ; **Stefan O Schoenberg MD, PhD *** ; **Katrin Zahn** ; **Thomas Schaible** ; **Lothar R Schad PhD** ; **Wolfgang Neff MD, PhD**

PURPOSE

Congenital diaphragmatic hernia (CDH) leads to lung hypoplasia. Using dynamic contrast enhanced (DCE) MR imaging, lung perfusion can be quantified. As according to simulations absolute MR perfusion values depend on temporal resolution, we compared two different MR protocols to investigate firstly if impaired ipsilateral lung perfusion is present with both protocols in 2-year old children after CDH repair, secondly if simulation results can be confirmed and thirdly which protocol should be preferred.

METHOD AND MATERIALS

DCE-MRI was performed in 36 children after CDH repair using a 3D TWIST sequence. Two MR protocols were applied: protocol A (n=18) based on a high spatial (3.0sec; voxel size: 1.25x1.25x1.25mm³) and protocol B (n=18) on a high temporal resolution (1.5sec; voxel size: 2x2x2mm³). 0.05mmol/kg body weight of contrast agent (Dotarem, Guerbet, France) was administered. Pulmonary blood flow (PBF) was calculated for both lung sides by placing 6 cylindrical regions of interest (ROI), apical, middle and basal, in the ventral and the dorsal lung, respectively. Peak signal to noise ratio (PSNR) was calculated.

RESULTS

CONCLUSION

In 2-year old children after CDH repair ipsilateral lung perfusion is significantly reduced. Higher temporal resolution and increased voxel size show a gain of PSNR and significantly decrease the underestimation of PBF. Protocol B should therefore be preferred, as a 2 mm³ isotropic voxel resolution is sufficient to detect side-differences of lung perfusion.

CLINICAL RELEVANCE/APPLICATION

In the long-term follow up of children after CDH, MR-perfusion imaging can help to quantify lung impairment without ionizing radiation. A temporal resolution of 1.5 sec is advisable.

VSPD31-08 • Translational Experience in the Treatment of Duchenne Muscular Dystrophy (DMD) by Intra-arterial Transplantation of Mesoangioblasts (MABs): From a Toxicity Study in 10 Beagle Dogs to the First, Phase-1 Study in 3 Dystrophic Children

Massimo Venturini MD (Presenter) ; **Giulio Cossu** ; **Letterio S Politi MD** ; **Michele Colombo** ; **Giulia Agostini** ; **Alessandro Del Maschio MD**

PURPOSE

Literature lacks of complete, single-center translational studies. DMD, a genetic syndrome characterized by progressive absence of dystrophin protein, causes progressive muscle degeneration, paralysis and death. Corticosteroids are not effective, while novel therapies (gene/stem cells) are on work. Our aim was to assess MABs intra-arterial infusion in Beagle dogs and, subsequently, in 3 dystrophic children, at escalating dose, to preliminarily assess the safety.

METHOD AND MATERIALS

Every 3 weeks, 10 dogs, under immunosuppressive treatment (cyclosporine-A), were submitted to 4 intra-arterial infusions each (2 in one lower limb, 2 in aorta), of either MABs (n=6) or placebo (n=4). Dogs were sacrificed to assess toxicity after 251 days. One year later, after the approval on behalf of the institutional ethical committee and obtaining written informed consent from the children's parents, every 2 months 3 DMD children (mean age=10 years) under immunosuppressive treatment (tacrolimus) were submitted to 4 allogeneic MABs intra-arterial infusions each (2 in one lower limb, 2 multidistrict) using a 4-Fr introducer/catheter. Efficacy was assessed every 2 months by quantitative strength measurements (Kin-Com-test) and thighs/legs fibro-fatty degeneration/quantification (MRI), and after 8 months by gastrocnemius biopsies.

RESULTS

No mortality related to MABs in Beagle dogs was recorded. The 12 intra-arterial MABs infusions were regularly performed with no peri-procedural complications, except for one successfully treated vasospasm. The only relevant complication was 1 focal thalamic ischemia of 1-cm (MRI) that occurred 5 hours after the fourth infusion, after sporadic atrial fibrillation (ECG) (Atrial-fibrillation-related-thrombosis? Late vasospasm?), without consequences. Relative stabilization/decrease in disease progression was observed. At MRI, a stabilization of fibro-fatty degeneration was more evident in the child treated at an earlier disease stage.

CONCLUSION

Our translational experience about MABs intra-arterial transplantation in DMD, showed no signs of toxicity in beagle dogs and a relative safe and partial effective in dystrophic children, with encouraging future perspectives.

CLINICAL RELEVANCE/APPLICATION

In DMD, a major MABs intra-arterial concentration, transplanted exclusively in the lower limbs, at an early disease stage, could determine an improvement of dystrophin restoration and clinical impact.

VSPD31-09 • Coronary Artery Imaging in Children

Cynthia K Rigsby MD (Presenter)

LEARNING OBJECTIVES

1) To provide an overview of the imaging modalities used to image coronary arteries in children. 2) To show examples of anomalies of coronary artery origin, course, and termination. 3) To illustrate coronary artery anomalies associated with congenital heart disease. 4) To demonstrate coronary artery findings in Kawasaki disease.

ABSTRACT

Coronary artery anomalies can be classified as anomalies of origin and course, anomalies of coronary termination, coronary anatomy with congenital heart disease and acquired coronary abnormalities. Normal coronary artery anatomy and an imaging focused discussion of each of the different type of coronary abnormalities will be presented.

VSPD31-10 • Correlation of CT and MR findings with Surgery for Anomalous Aortic Origin of Coronary Arteries (AAOCA)

Lamya A Atweh MD (Presenter) ; **Carlos M Mery MD** ; **Prakash M Masand MD** ; **Silvana M Lawrence MD, PhD** ; **Dean E McKenzie** ; **Rajesh Krishnamurthy MD ***

PURPOSE

Anomalous aortic origin of the coronary artery (AAOCA) is commonly evaluated with magnetic resonance imaging (MRI) or computed tomography (CT) prior to surgery. Imaging targets include ostial location and morphology, intramurality, and presence of proximal stenosis. Precise description of the AAOCA morphology is important for surgical planning. Our objective is to correlate CT and or MRI with surgical findings in this high-risk population.

METHOD AND MATERIALS

IRB approval was obtained for our retrospective study. We identified all patients with AAOCA who were operated at our institution from 2003-2013. Patients who had no imaging available for review were excluded. Imaging was reviewed by a pediatric radiologist with 13 years of experience in cardiac imaging who was blinded to the results of the surgeries. Studies were assessed for the type of AAOCA, location and morphology of the anomalous ostium, right-left ostial relationship, and presence and length of intramural course. Surgical

findings were reviewed for the same variables. The imaging interpretations were compared to the surgical data for concordance.

RESULTS

The patient population consisted of 16 patients (M:F = 10:6; age: 10 years ± 5), with 8 CT and 10 MR exams. 2 patients had both MRI and CT. CT was more accurate than MRI for all imaging targets (Table). MRI accurately predicted the type of coronary artery anomaly (90%) and ostial location (80%), but fared poorly in predicting type of R-L ostial relationship (60%), ostial morphology (10%) and intramural (30%). Apart from its high accuracy for imaging targets, CT also provided virtual angioscopic views of the ostia that simulated surgical exposure.

CONCLUSION

CT is more accurate than MRI for characterization of critical imaging targets of AAOCA.

CLINICAL RELEVANCE/APPLICATION

CT is more accurate than MRI in defining ostial morphology, ostial relationship and intramural course and should be the imaging method of choice for AAOCA.

VSPD31-11 • Compression of the Left Anterior Descending Artery during Percutaneous Pulmonary Valve Replacement: The Protective Role of Epicardial Fat?

Ladonna J Malone MD (Presenter) ; Uyen Truong ; Brian Fonseca ; Thomas Fagan MD ; Lorna Browne MD, FRCR

PURPOSE

The advent of percutaneous pulmonary valve replacement (PVR), providing a nonsurgical approach to the management of severe pulmonary regurgitation in patients with right ventricle to pulmonary artery (RV-PA) conduits, has transformed treatment of patients with repaired congenital heart disease. Extrinsic compression of the left anterior descending artery (LAD) during percutaneous PVR is a rare but potentially catastrophic complication, necessitating preoperative selective coronary angiogram with test balloon inflation to assess risk. If LAD occlusion is demonstrated, the percutaneous PVR is aborted. Cardiac MRI (CMR) is the gold standard in measuring RV size and optimal timing of PVR. Although LAD anatomy is well delineated on CMR, the minimum separation between the RV-PA conduit and LAD that would prevent LAD compression is unknown.

METHOD AND MATERIALS

16 patients underwent CMR prior to percutaneous PVR. Prior to PVR, 2 patients demonstrated extrinsic compression of the LAD during test balloon inflation while the other 14 did not. CMRs in both groups were retrospectively reviewed and the following data recorded in each: i) shortest distance between LAD and RV- PA conduit, ii) presence of circumferential epicardial fat surrounding the LAD, iii) thickness of conduit calcification, iv) proximal LAD course and v) relative position of the great vessels. Mean distance and minimum distance between LAD and RV-PA conduit were calculated in all patients and parameters in both patient groups compared.

RESULTS

In patients without extrinsic LAD compression, the mean distance from LAD to RV-PA conduit was 6.8 mm. The minimum distance was 1.6 mm. All these patients demonstrated a circumferential cuff of epicardial fat between the LAD and RV-PA conduit. Both patients with LAD compression had no measureable distance (0 mm) between the conduit wall and LAD, and a circumferential cuff of epicardial fat was absent. There was no significant difference in conduit calcification thickness between the two groups.

CONCLUSION

A circumferential cuff of epicardial fat between the LAD and RV-PA conduit decreases risk of extrinsic LAD compression during percutaneous PVR.

CLINICAL RELEVANCE/APPLICATION

The absence of a circumferential cuff of epicardial fat between the LAD and RV-PA conduit on a pre PVR CMR should raise concern for potential LAD compression during percutaneous PVR.

VSPD31-12 • Cardiovascular CT in Neonates and Infants: Comparison of Effective Radiation Dose between Target-mode Prospective EKG-gated Volumetric CT Using 320 Detector Scanner and Ungated CT Using 64-slice Scanner

Siddharth P Jadhav MD (Presenter) ; Prakash M Masand MD ; Rajesh Krishnamurthy MD *

PURPOSE

The target mode of prospective EKG gating with the volumetric 320 detector scanner provides cardiac pulsation-related motion compensation for cardiovascular imaging without increasing radiation exposure when compared to ungated volumetric studies. The objective of this study is to compare target mode volumetric imaging (320) to ungated 64 slice imaging (64) for cardiovascular studies in neonates and infants for image quality, diagnostic efficacy and radiation exposure.

METHOD AND MATERIALS

Following IRB approval, a retrospective evaluation of our experience with CTA for cardiovascular indications in neonates and infants aged 0-6 months was performed. 29 patients who underwent ungated imaging with 64 slice scanner from 2010-2012, and 22 patients who underwent volumetric imaging with the target protocol on the 320 detector scanner in 2012-2013 were included. Parameters collected included clinical history, indication for CT, qualitative assessment of image noise and pulsation related blurring, diagnostic efficacy, and radiation dose parameters (CTDI and DLP). Comparison was made to catheterization data and surgical reports for diagnostic accuracy.

RESULTS

The distribution of clinical indications was comparable between the 64 and 320 groups, and included status of branch pulmonary arteries in Tetralogy of Fallot, evaluation of aortopulmonary collaterals or ductal dependent pulmonary flow in pulmonary atresia, anomalous pulmonary venous return, pulmonary vein stenosis, coarctation, heterotaxy, and vascular mediated airway compromise. All studies were diagnostic for the main clinical indication. Average DLP for target 320 studies was 11.6, with average effective dose of 0.75 mSv using conversion tables from ICRP publication 103. Average DLP for 64 slice studies was 63.88, with average effective dose of 4.31 mSv. The 320 studies resulted in higher image quality related to less pulsation artifact, with visualization of coronary origins in all but one case.

CONCLUSION

Volumetric imaging with the target mode offers several advantages over previous generation scanners for cardiovascular indications in infants, including a 82% reduction in effective dose, ability to perform free-breathing studies, and improved image quality.

CLINICAL RELEVANCE/APPLICATION

Volumetric imaging with target-mode of EKG gating offers improved image quality and reduced radiation dose when compared to 64 slice CT for cardiovascular imaging in neonates and infants.

VSPD31-13 • Radiation Dose and Image Quality Comparison of Three Scan Schemes in Retrospective ECG-gated Coronary CT Angiography for Pediatric Patients

Zhiming Liu MD (Presenter) ; Yong Li Cao ; Yun Peng MD

PURPOSE

Retrospective ECG-gated coronary CT angiography (CCTA) is often used in children because of their higher heart rates. In this study, we assessed the image quality and radiation dose of three scan schemes in order to select an optimal retrospective CCTA technique for maximum dose reduction.

METHOD AND MATERIALS

60 consecutive patients (ages: 2months - 13years) were randomly assigned to three groups (20 in each group) for retrospectively

ECG-gated CCTA with different tube current (mA) selection schemes. The tube voltage was 80kV, gantry rotation speed was 0.35s and helical pitches were between 0.16 and 0.20 based on patient heart rates for all groups. Group A used a fixed 350mA, group B used ECG modulated mA (350mA for 40-80% cardiac phases and 70mA for other phases), and group C also applied patient-dependent mA selection scheme for ECG modulation. The patient-dependent mA selection method was based on the CT value measurement in the scout view for individual patients. Image quality was assessed and image noise and CTDI value were measured for the three groups, and statistically compared with SPSS13.0.

RESULTS

Image noises and their standard deviations were 25.5 ± 4.3 HU, 25.0 ± 4.8 HU and 24.8 ± 1.2 HU, respectively, with no difference among the three groups ($p > 0.05$). Group C had much less deviation in image noise than groups A and B. There were no statistical difference between image quality scores among the three groups (4.3 ± 0.4 , 4.4 ± 0.3 and 4.5 ± 0.4 , all $p > 0.05$). The effective doses were 4.39mSv, 3.23mSv and 2.34mSv for groups A, B and C, respectively. Dose reductions of 26% and 47% were achieved for groups B and C, respectively, compared with group A with the use of a fixed mA. Group C with the patient-dependent mA for ECG modulation had the lowest effective dose.

CONCLUSION

Patient-dependent tube current scheme in retrospective CCTA for pediatric patients allows us to achieve a desired and consistent image quality across patient population, with the lowest radiation dose to patients.

CLINICAL RELEVANCE/APPLICATION

Low kVp and patient-dependent mA in retrospective CCTA for pediatric patients allows us to achieve a consistent image quality across patient population, with the lowest radiation dose to patients.

VSPD31-14 • Head Tracked Stereoscopic Pre-surgical Evaluation of Major Aortopulmonary Collateral Arteries in the Newborns

Francies P Chan MD, PhD (Presenter) * ; Sergio Aguirre * ; Holly Bauser-Heaton MD, PhD ; Frank Hanley MD ; Stanton B Perry MD

PURPOSE

Children born with pulmonary atresia (PA) with major aortopulmonary collateral arteries (MAPCA) undergo early surgery to reconstruct their central pulmonary arteries. This surgery, unifocalization, requires precise mapping of all native vessels supplying the lungs and this is currently accomplished by catheter angiography (CA), with supplemental 3D information from CTA. As each patient has his unique vascular anatomy, visual comprehension can be extremely challenging. A recently developed head tracked stereoscopic system, True 3D, helps user manipulate and inspect 3D objects in free space. We test the hypotheses that interpretation of CTA in MAPCA cases using True 3D is faster than and as accurate as traditional tomographic readout.

METHOD AND MATERIALS

With IRB approval, newborns less than 10-days old diagnosed with PA and MAPCA, who had CA and CTA of the chest within 2 weeks, were identified between 2007 and 2011. The CA images were evaluated by an experienced cardiologist for the origins and destinations of each native pulmonary artery and MAPCA to the lung segments. The CTA images were similarly scored by a cardiac radiologist using traditional tomographic readout and True 3D in two sessions separated by 4 weeks. Using CA as the reference standard, sensitivity, specificity, accuracy, these two approaches were calculated. Interpretation times were compared using paired Student's t-test.

RESULTS

9 newborns (mean weight 3.2kg) produced 25 traceable MAPCAs in addition to native pulmonary arteries. Using an 18-segments lung model, 774 distinct vessel-segment combinations were compared. The sensitivity, specificity, and accuracy of tomographic readout are 81%, 93% and 91% respectively. For True 3D, they are 90%, 91% and 91% respectively. The average time for interpretation is significantly shorter with True 3D, 13 ± 4 min, than with tomographic readout, 22 ± 7 min ($P=0.0004$).

CONCLUSION

This preliminary study demonstrates that head tracked stereoscopic interpretation of complex, minute pulmonary vessels in the newborn is as accurate as traditional readout. The interpretation time is significantly faster with True 3D, and this is likely due to enhanced visual cognition using the stereoscopic approach.

CLINICAL RELEVANCE/APPLICATION

Advanced digital stereoscopy enhances visual cognition of complex anatomic relationship and is recommended for the evaluation of congenital anomalies of the pulmonary vasculature.

VSPD31-15 • Determining the Normal Aorta Size in Infants and Children

S. Bruce Greenberg MD ; Shilpa Hegde MD (Presenter) ; Shelly Lensing

PURPOSE

No adequate standards for determining the normal range of effective diameters of the aorta or iliac arteries in children using CT or MRI exist. Our purpose is to establish normal standards for the effective diameter of the aorta at multiple levels and of the iliac artery origins.

METHOD AND MATERIALS

Chest, abdomen and pelvis computed tomography examinations with intravenous contrast performed in children without cardiovascular disease provided the data sets. Body surface area (BSA) was calculated from patient height and weight for each patient. Children age ranged from 0 to 20 years (mean 9.5 years, sd 5.7). Body surface area ranged from 0.2 to 2.5 meter² (mean 1.23 meter², sd 0.59). Chest measurements were performed on 88 children and abdomen measurements on 110 children. Double-oblique 1 mm reconstructions were used to measure aorta and iliac artery effective diameter at multiple locations by two pediatric radiologists. Pearson correlation and linear regression compared the body surface area and effective diameter measurements.

RESULTS

The results are summarized in the table. Very strong correlation between BSA and effective diameter were present at all measured levels of the aorta and the iliac arteries. The derived linear regression equations and beta standard error are included in the table. **Aorta or iliac artery level Pearson correlation Effective diameter (mm) Beta S.E.** aorta annulus 0.94 10 + (7.8) BSA 0.30 sinus of Valsalva 0.93 11.8 + (9.5) BSA 0.41 STJ 0.90 8.9 + (8.2) BSA 0.43 Ascending aorta 0.91 9.1 + (8.6) BSA 0.43 Aorta arch 0.93 6.8 + (8.2) BSA 0.35 Isthmus 0.94 6.5 + (7.1) BSA 0.29 Prox desc aorta 0.93 6.5 + (6.6) BSA 0.29 Aorta at diaphragm 0.93 6.2 + (5.2) BSA 0.24 Superior to celiac axis 0.92 5.8 + (5.2) BSA 0.22 Renal artery level 0.91 4.2 + (5.0) BSA 0.22 Distal abdominal aorta 0.91 4.0 + (4.6) BSA 0.21 Right iliac artery 0.88 2.8 + (3.2) BSA 0.17 Left iliac artery 0.89 2.9 + (3.1) BSA 0.16

CONCLUSION

The expected effective diameter for children of any expected body surface area can be calculated from the equations at 8 levels in the chest and three levels in the abdomen. The common iliac artery effective diameters can also be calculated.

CLINICAL RELEVANCE/APPLICATION

The linear regression analysis equations allow radiologists to quantitatively determine if the aorta is hypoplastic or aneurysmal in children rather than rely on subjective impression.

VSPD31-16 • Imaging of Adolescents and Young Adults with Congenital Heart Disease

Lorna Browne MD, FRCR (Presenter)

LEARNING OBJECTIVES

1) Describe the relevant complex cardiac anatomy encountered in CHD adolescents and young adults, many of whom have undergone

prior surgical repairs. 2) Describe the most likely lesions encountered in CHD adolescents and young adults. 3) Discuss some common surgical repairs and encountered complications. 4) Determine appropriate MR protocols for evaluating congenital heart disease according to the anatomic, pathologic, and hemodynamic characteristics of the defect and type of previous surgical repair. 5) Discuss the main clinical questions that are specifically posed in individual cases of pre and post operative CHD in adolescents and young adults.

Pediatric Radiology - Tuesday Scientific Posters and Exhibits (12:15pm - 12:45pm)

Tuesday, 12:15 PM - 12:45 PM • S101AB

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PD

CL-PDS-TUA • AMA PRA Category 1 Credit™:0.5

Host
Randolph K Otto, MD

CL-PDS-TU1A • Cardiovascular Metastases of Osteosarcoma: Spectrum of Imaging Findings and Analysis of 19 Patients

Sireesha Yedururi MBBS (Presenter) ; Nancy E Fitzgerald MD ; Ajaykumar C Morani MD ; Padmahasta Pilla MBBS ; Gregory W Gladish MD ; Pete Anderson MD ; Dennis Hughes MD, PhD ; Najat C Daw Bitar MD

PURPOSE/AIM

The purpose of this exhibit is to illustrate:

1. Radiologic findings of cardiovascular metastases of osteosarcoma (OS)
2. Temporal evolution of pulmonary vascular metastasis from a mineralized dilated pulmonary artery terminal branch to the left heart
3. How to differentiate between tumor thrombus and bland thrombus

CONTENT ORGANIZATION

1. Patient demographics
2. Natural history
3. Common sites: Systemic and pulmonary vessels and the heart
4. Imaging findings: Early and serial imaging findings
5. Role of PET/CT, cardiac MRI and serial chest CT in localizing and confirming a tumor thrombus
6. Prognosis
7. Impact of accurate and timely recognition on patient care / management.
8. Pitfalls: Endobronchial metastases and tumor along bronchovascular lymphatics mimic tumor thrombus
9. Future direction

SUMMARY

The main teaching points are:

1. Cardiovascular metastases are rare in OS and occur in the setting of advanced disease
2. Tumor thrombus should be considered in OS patients presenting with systemic venous or pulmonary thromboembolism and should not be misinterpreted as bland thrombus.
3. Dilated and mineralized terminal pulmonary arterial branch is an early indication of vascular metastasis which may progress to involve draining pulmonary veins and the left heart.

CL-PDS-TU2A • The Optimal Dose Reduction Level Using Iterative Reconstruction with Prospective ECG-triggered Volume Cardiac CT Angiography Using 640-slice MDCT in Little Swine Model

Pengfei Zhao (Presenter) ; Yang Hou MD ; Qin Liu MA, BA ; Yisha Fan ; Qiyong Guo MD

PURPOSE

To evaluate the radiation dose and image quality (IQ) of an iterative reconstruction (AIDR3D) in combination with SureExposure^{3D} on a 640-slice CT and determine the optimal dose reduction using AIDR3D for cardiac CTA that can provide IQ comparable to filtered back projection (FBP).

METHOD AND MATERIALS

A series of 22 normal swine (body weight 8.0 ± 3.2 kg) underwent 640-slice MDCT cardiac CTA (Aquilion One, Toshiba) for 4 times with 80KVp and different mAs. SureExposure^{3D} technique was used and the Index of noise was set to SD20 (Group A, routine dose), 25, 30, 35 (Group B-D) to reduce dose successively. Group A were reconstructed with FBP. Group B-D were reconstructed using AIDR3D (strong level). Two radiologists graded IQ by reviewing both cardiac and vascular structures using a 5-point scale in a blinded manner. Quantitative IQ parameters of image noise, signal-to-noise (SNR), contrast-to-noise (CNR) were measured in each group. A receiver-operating characteristic (ROC) analysis was performed to establish a radiation reduction threshold up to which comparable IQ (score=4) was maintained.

RESULTS

Group B, C and D had significantly lower noise (p

CONCLUSION

Using AIDR3D technique, 80KVp with SureExposure^{3D} (SD30) can provide comparable or even better IQ than routine dose with FBP reconstruction, and 54% ED reduction can be acquired in little swine model.

CLINICAL RELEVANCE/APPLICATION

The results of swine model may be applied to reducing radiation dose of cardiac CTA scanning in infants and little children with congenital heart disease (CHD).

CL-PDS-TU3A • The Value of Dual Energy CT in Diagnosing Pulmonary Embolism in Children

Chunxiang Tang MS (Presenter) ; Luo Song ; Long Jiang Zhang MD, PhD ; Zhou Changsheng DMRD ; JiuHong Chen MD, PhD * ; Lu Guangming MD

PURPOSE

To evaluate the value of dual energy CT with application of Lung Vessels, a dedicated algorithm color-coding software which was developed to discriminate non-enhancing subsegmental pulmonary arteries from enhancing ones by using dual energy iodine extraction data, in diagnosing pulmonary embolism (PE) of children.

METHOD AND MATERIALS

47 patients with nephrotic syndrome and aged =18 years old (32 male, 15 female, mean age 15 years). Two radiologists detected the presence or absence of emboli and counted the clots on a per-patient and per-lobe basis with Lung Vessels, respectively. With conventional CT pulmonary angiography (CTPA) as reference standard, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) were computed to detect PE for two readers with Lung Vessels application. Inter-reader agreement was also calculated.

RESULTS

CONCLUSION

Dual energy CT with Lung Vessels application has a high sensitivity and negative predictive value for PE detection in children. More clots were detected with Lung Vessels application than conventional CTPA, which deserved further investigation.

CLINICAL RELEVANCE/APPLICATION

Implications for patient care: Dual energy CT with Lung Vessels application has a promising application in children with suspected pulmonary embolism.

CL-PDS-TU4A • Evaluation of Organ-specific Dose Reduction (OSDR) in Pediatric Chest Computed Tomography (CT)

Johannes Boos (Presenter) ; **Patric Kroepil MD** ; **Philipp Heusch MD** ; **Dirk Klee MD** ; **Gerald Antoch MD *** ; **Rotem S Lanzman MD**

PURPOSE

Organ-specific dose reduction (OSDR) algorithms can significantly reduce the radiation exposure to radiosensitive tissues. The purpose of this study was to assess the impact of a novel OSDR algorithm on image quality of pediatric chest computed tomography (CT).

METHOD AND MATERIALS

Twenty pediatric patients (8 male, 12 female; mean age 12.4 ± 5.6 years (range 3-17 years)) undergoing contrast-enhanced chest CT examinations on a 128-row-CT scanner were included in this study. CT scans were performed at 100 kV using automated tube current modulation and a novel OSDR algorithm (XCare, Siemens AG, Forchheim, Germany). Nine patients had a previous chest examination performed on a 64-row-CT scanner at 100 kV without the OSDR algorithm. Subjective image quality was assessed using a five-point-scale (1- not diagnostic; 5- excellent) in all patients. In 9 children who underwent CT scans with and without OSDR, ROI measurements were performed in order to assess the contrast-to-noise ratio (CNR) and signal-to-noise ratio (SNR) in the aorta. Furthermore, CTDIvol was determined in order to compare the radiation dose.

RESULTS

In 20 patients, mean subjective image quality was 4.3 ± 0.7 . In 9 patients that were also examined without OSDR, subjective image quality was comparable with OSDR (4.4 ± 0.5) and without OSDR (4.2 ± 0.4) ($p > 0.05$). Furthermore, there was no significant difference in mean SNR and CNR of the aorta with OSDR (31.6 ± 17.1 and 22.3 ± 15.0 , respectively) and without OSDR (27.4 ± 13.3 and 18.8 ± 12.4 , respectively) ($p > 0.05$).

CTDIvol did not differ significant between acquisitions with OSDR (2.3 ± 0.9 mGy) and without OSDR (2.6 ± 1.9 mGy) ($p > 0.05$).

CONCLUSION

Organ-specific dose reduction does not seem to impact the image quality of pediatric chest CT examinations. It can therefore be used in clinical routine in order to reduce the radiation exposure to radiosensitive tissues as the breast or thyroid gland.

CLINICAL RELEVANCE/APPLICATION

Organ-specific dose reduction algorithms can be recommended for pediatric chest CT examinations as image quality does not seem to be affected.

CL-PDS-TU5A • Utility of MDCT MIP Post-processing Reconstruction Images in Children with Hereditary Hemorrhagic Telangiectasia (HHT)

Emilio Inarejos Clemente MD (Presenter) ; **Felix Ratjen** ; **Giuseppe A Latino** ; **David E Manson MD**

PURPOSE

To determine whether the use of MIP post-processing reconstructions images can increase the detection of pulmonary nodules and AVMs in the lungs in children with HHT. To evaluate whether MIP images improve the detection of the feeding artery and draining vein for definite AVMs.

METHOD AND MATERIALS

We reviewed the chest CT scans in 39 children (ages 0-18) with genetically and clinically proven HHT who underwent a chest MDCT from 2005 to 2012. The images were retrospectively reviewed blinded and independently by 2 radiologists, one pediatric radiologist (DM) and one senior pediatric radiologist fellow (EIC). Initial standard 3 plane 2.5mm slices were first evaluated on a lung algorithm for the presence of nodules and/or overt AVMs, and the ability to identify feeding arteries and draining veins from the AVMs. Three plane sliding MIP post-processing reconstruction images were then blindly reviewed for the same findings. Discrepancies were resolved by consensus. Parameters assessed: number of definitive nodules, number of definitive AVM and visibility of the feeding artery or draining vein in both conventional and MIPS.

RESULTS

Statistically significant differences were obtained in the ability to identify the feeding artery and draining vein between standard 2.5mm slices and MIP images (p

CONCLUSION

MDCT in children with HHT should routinely include 3 plane sliding MIP reconstruction images to help to analyze the anatomy of AVMs for planning future embolization.

CLINICAL RELEVANCE/APPLICATION

MDCT with 3 plane sliding MIPS can be used to follow children with HHT induced AVMs and can be used to simplify therapeutic angiographic embolization.

CL-PDE-TU6A • Pediatric Body MRI in the 3rd Dimension: Making SPACE for 3-D T2 Weighted Imaging in the Abdomen and Pelvis

Eric C Ehman MD (Presenter) ; **Peter A Marcovici MD** ; **Andrew S Phelps MD** ; **Pauline W Worters PhD *** ; **John D MacKenzie MD** ; **Jesse L Courtier MD**

PURPOSE/AIM

3-D T2 weighted MRI (CUBE [GE] /SPACE[Siemens]/VISTA [Phillips]) now allows for thin slice, high resolution imaging in the abdomen/pelvis with multiplanar reformatting capability. In pediatric patients, this allows for improved depiction of smaller anatomic structures and reduced scan time. This exhibit will describe the technique, performance, and multiple applications of this sequence.

CONTENT ORGANIZATION

Technique, performance, and multiple uses for 3-D T2 weighted imaging in pediatric body MRI at 3T will be discussed. Content will be organized as follows: I. Technique

a. Protocol and considerations at 3T b. Technical challenges: optimization of scan time, minimization of bowel/respiratory motion artifact, imaging the neonate and toddler II. Applications in: a. Pancreatico-biliary system b. Liver masses c. Complex neonatal pelvic pathology d. Mullerian duct anomalies

SUMMARY

SUMMARY

This exhibit provides the viewer with a guide on how to implement 3-D T2 weighted imaging into their current Pediatric MR abdomen / pelvis protocol. Illustrative case examples are provided demonstrating the utility of this sequence in multiple clinical scenarios. Tips for overcoming technical challenges are given. FIGURE Coronal oblique 3DT2 weighted MRI in a 7 year-old showing a dilated pancreatic duct and multiple small stones (white arrows).

CL-PDE-TU7A • Serial Magnetic Resonance Imaging of Hypothermia Treated Neonatal Hypoxic Ischemic Encephalopathy: Brain Injury Pattern and Temporal Evolution

Yauk Lee MD (Presenter) ; Alex C Penn MD ; Mahesh R Patel MD * ; Rajul P Pandit MD ; Dongli Song ; Bo Yoon Ha MD

PURPOSE/AIM

1) To review common patterns of neonatal hypoxic ischemic encephalopathy after therapeutic hypothermia during the acute phase 2) To review interval development and evolution of ischemic changes during the subacute phase 3) To review sequelae of disease during the chronic phase

CONTENT ORGANIZATION

1) Illustrate common patterns on initial MRI (1-2 days of life): predominately peripheral white matter injury, predominately deep gray nuclei injury, and diffuse global injury 2) Illustrate cases of interval development and evolution of ischemic changes on follow-up MRI (3-10 days of life), including later pseudo-normalization of mean diffusivity 3) Illustrate cases of long-term sequelae such as hemorrhagic conversion and encephalomalacia

SUMMARY

1) Hypothermia treated brain injury in the setting of neonatal hypoxic ischemic encephalopathy may exist along a spectrum of patterns with delayed evolution of injury compared to normothermic neonates in the literature 2) Diffuse global injury is associated with long-term sequelae on imaging including atrophy and encephalomalacia

Pediatric Radiology - Tuesday Posters and Exhibits (12:45 - 1:15PM)

Tuesday, 12:45 PM - 01:15 PM • S101AB



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CL-PDS-TUB • AMA PRA Category 1 Credit™:0.5

CL-PDS-TU1B • Clinical Application of Coronary Artery Fistulas in Children by Dual-source CT

Zhaoping Cheng MD (Presenter) ; Ximing Wang PhD

PURPOSE

To explore the clinical usefulness of coronary artery fistulas (CAF) in children by low-dose dual-source CT (DSCT) angiography.

METHOD AND MATERIALS

A total of 22 patients (mean age 3.2±1.5yrs, age range 1.2-6.0yrs; male 12) with CAF who underwent DSCT angiography under free breathing were retrospectively included. Surgery was performed in 9 patients, and transcatheter closure in 13 patients. The accuracy of DSCT was calculated based on the surgical or conventional cardiac angiography (CCA) findings. The subjective image quality was evaluated on a four-point scale by two radiologists. Radiation dose values were calculated.

RESULTS

All images were diagnosable. The average subjective image quality score was 2.6±0.7 (2-4). Two radiologists made good agreement (k=0.75). 25 coronary artery fistulas in all patients were accurately displayed with DSCT with the accuracy of 100%. There were 13 (59.1%) patients with right coronary artery fistulas, 8 (36.4%) with left coronary artery fistulas and 1 (4.5%) with dual coronary artery fistulas. There were four patients associated with coronary artery aneurysms. The ED was 0.25 ±0.07 mSv.

CONCLUSION

Low-dose DSCT angiography provides high diagnostic accuracy for the assessment of coronary artery fistulas in children.

CLINICAL RELEVANCE/APPLICATION

DSCTA provides excellent visualization of the origin, course, and distal vessel entry site and the size of the receiving chamber in children with CAF.

CL-PDS-TU2B • Quantification of Brain Phenylalanine Levels in Hyperphenylalaninemia Patients by MRS at 3T: A Preliminary Report

Ali Yusuf Oner MD (Presenter) ; Aynur Kucukcongar ; Murat Ucar ; Fatih Ezgu ; Turgut E Tali MD *

PURPOSE

Hyperphenylalaninemia (HPA) is an inborn error of metabolism in which the hydroxylation of phenylalanine (Phe) to tyrosine is disturbed. Accumulation of Phe leads to severe mental and psychomotor retardation. Magnetic resonance spectroscopy (MRS) is a non-invasive method to quantitate Phe concentration in HPA patients. The aim of this study is to investigate the correlation between blood and brain Phe levels, before and following treatment in HPA patients.

METHOD AND MATERIALS

Institutional review board approval and informed consent was obtained from all patients. Totally ten patients diagnosed with HPA were studied, including five boys and five girls (age ranging from 2 to 19 years). The patients were divided into two groups: Tetrahydrobiopterin (BH4) responsive (n = 4) and non-responsive (diet group, n = 6). Multivoxel MRS at 3T were performed to measure brain Phe levels using creatine as an internal reference in all patients, before and after treatment (Phe-restricted diet or BH4). Blood Phe levels were simultaneously measured by High-performance liquid chromatography.

RESULTS

The blood Phe levels were found to be statistically significant between pre and post-treatment measurements in all cases (p= 0,008). Following treatment, brain Phe levels in the diet group were found to be significantly decreased (p=0,027). For the second group, there was no statistically significant difference between two brain Phe measurements recorded (p=0,068). Significant positive correlation between blood and brain Phe level was present for both group, but with only statistical significance in the diet population.

CONCLUSION

MRS can be used to non-invasively quantitate intracerebral Phe concentrations in HPA patients. Preliminary findings suggest that interindividual variations in the kinetics of Phe uptake and metabolism do exist. MRS can therefore provide proper objective standards for better diagnosis and treatment of HPA patients.

CLINICAL RELEVANCE/APPLICATION

Quantification of brain Phe is important in treatment monitoring of HPA patients. MRS can be used in non-invasive evaluation of brain Phe levels in this patient population.

CL-PDS-TU3B • Dual Source Pediatric Cardiac Computed Tomography-Techniques and Radiation Dose

Torel Ogur MD ; Patrick T Norton MD (Presenter) ; Juan Carlos Ramirez Giraldo PhD ; Klaus D Hagspiel MD *

PURPOSE

To compare the radiation dose and image quality of pediatric cardiac computed tomography angiography (CCTA) examinations using existing scan modes on dual source (DS) scanners.

METHOD AND MATERIALS

CCTA scans of 56 pediatric patients (age range 1d - 18yrs, mean 7.8±7.9 yrs) were reviewed retrospectively. Scans were performed on first or second generation DS CT systems. Scans were divided into 3 groups according to scan mode: retrospective ECG-gated helical (RETRO) (n=33), prospective ECG-triggered sequential (PRO) (n=8) and high-pitch spiral (FLASH) (n=15). The impact in radiation dose of automated dose-optimized selection of x-ray tube voltage (CARE kV), available in second generation DS scanner, was also assessed, relative to manual tube voltage selection in first generation DS. Size-specific dose estimate (SSDE) and effective dose were calculated. Image quality was assessed qualitatively by two radiologists on a 5 point Likert scale.

RESULTS

For RETRO scans, PRO scans and FLASH scans the mean effective dose values (mSv) were 3.90±2.98, 3.33±2.13, and 2.01±1.05 and mean SSDE values (mGy) were 13.90±9.52, 13.85±12.14, and 4.23±2.69. The differences in effective doses between RETRO and FLASH modes were statistically significant (p

CONCLUSION

Using high pitch spiral mode, low RD pediatric DS CCTA can be performed without sacrificing quality. The use of automated dose-optimized selection of kV resulted in the lowest doses.

CLINICAL RELEVANCE/APPLICATION

When using DS scanners for pediatric cardiac CTA, high pitch spiral mode and automatic kV selection should be employed to produce high quality examinations with the minimal radiation dose possible.

CL-PDS-TU4B • Diagnostic Accuracy of Ultrasonography (US) Examination for the Evaluation of Nutcracker Syndrome (NS): Comparison with Multidetector-row Computed Tomography (MDCT) as a Reference Standard

Minho Park MD ; Sung Kyong Moon (Presenter) ; Seong Jin Park MD, PhD ; Joo Won Lim ; Dong Ho Lee MD ; Young Tae Ko MD, PhD

PURPOSE

To assess the diagnostic accuracy of US for the evaluation of pediatric NS patients with urinalysis abnormality (UA) compared with MDCT as a reference standard.

METHOD AND MATERIALS

This study included 66 pediatric patients with UA who underwent MDCT and US for the past 7 years. Eighteen patients with other biopsy-proven or clinically diagnosed renal diseases were excluded. MDCT and US images of 48 patients were reviewed retrospectively. By CT, AP diameters of the left renal vein (LRV) at the hilum (CDh) and aortomesenteric space (AMS, CDa) and the diameter ratio (CDh/a) were assessed. The presence of a beak sign of LRV at AMS and corticomedullary enhancement difference between both kidneys (CMD) in the portal phase were assessed. Patients were grouped as Gr 1 (high NS probability) and Gr 2 (low NS probability) according to the following CT criteria: 1) CDh/a>4; 2) presence of beak sign; and 3) presence of CMD. Patients with two or more criteria were categorized as Gr 1. By US, the AP diameters of LRV at the hilum (UDh) and AMS (UDa), diameter ratio (UDh/a), flow velocity at the hilum (Vh) and AMS (Va), and flow velocity ratio (Vh/a) were assessed. Twenty-four-hour urine proteinuria tests and US parameters were compared using an independent t-test.

RESULTS

Gr 1 and 2 comprised 30 and 18 patients, respectively. The mean CDh, CDa, and CDh/a in Gr 1 were 9.9±1.2 mm, 1.9±0.5 mm, and 5.9±3.2 mm, respectively. The mean CDh, CDa, and CDh/a in Gr 2 were 9.0±1.5 mm, 2.9±0.8 mm, and 3.4±1.1 mm, respectively. A significant difference existed in the 24-h urine proteinuria level between the groups (216.3±49.0 mg/d in Gr 1 vs. 133.4±58.8 mg/d in Gr 2; P<0.05). Vh, Va, and Vh/a showed no significant difference (Gr 1 vs. Gr 2: 22.5±7.6 cm/s vs. 22.0±6.7 cm/s, 135.0±30.4 cm/s vs. 122.1±37.7 cm/s, and 7.8±9.0 cm/s vs. 5.9±2.3 cm/s, respectively; P>0.05).

CONCLUSION

Based on MDCT, precise diagnosis of NS by US is difficult. Thus, US should be performed with care in patients who may have NS.

CLINICAL RELEVANCE/APPLICATION

When NS is doubtful in US, MDCT should be considered for a more accurate diagnosis, even in pediatric patients.

CL-PDS-TU5B • Specific Features of Pediatric Crohns Disease Detected at MRE

Najwa Al Ansari MD (Presenter) ; Francesca Maccioni MD ; Valentina De Marco MD ; Valeria Buonocore ; Carlo Catalano MD

PURPOSE

to retrospectively describe Crohn's disease (CD) in paediatric patients (PP) in terms of the location and activity of intestinal lesions.

METHOD AND MATERIALS

70 children (mean age 15 years) with proven CD underwent magnetic resonance enterography (MRE), after the administration of negative or biphasic contrast agent, according to age and compliance of the patients. to localize lesions and detect their activity in 9 segments of the small and large bowel. The results were analyzed on a per patient and per segment basis. Ileo-colonoscopy was performed in all patients.

RESULTS

involvement of terminal ileum was observed in 60 % of PP. The colon was diseased in 87 % of PP. In particular, left colonic segments were significantly involved in PP (descending colon 58 %; rectum 68 % sigmoid colon 58 %). The maximal disease activity was found in the left colonic segments.

CONCLUSION

MRE detected significant features of CD in PP, showing a more extensive and severe involvement of the left colon than distal ileum, differently from adult patients. The causes of the severe left colonic disease in children are unknown and may have relevant clinical-diagnostic implications.

CLINICAL RELEVANCE/APPLICATION

MRE detected significant features of CD in PP, showing a more extensive and severe involvement of the left colon than distal ileum, differently from adult patients

CL-PDE-TU6B • “Single Ventricle” Demystified - A Radiologist Perspective

Kianoush Ansari Gilani MD ; Ravi Ashwath MD ; Prabhakar Rajiah MD, FRCR (Presenter)

PURPOSE/AIM

- Single ventricle refers to a heterogeneous group of congenital cardiac malformations that is characterized by both the atria related to a functionally single ventricle. The purpose of this exhibit is 1. To understand the various entities that constitute single ventricle.
- To understand the various surgical options and timings for single ventricle.
- To illustrate the MR imaging appearances of several types of single ventricle.
- To describe the key MRI findings which are vital in influencing management.

CONTENT ORGANIZATION

- Nomenclature
- Cardiac MRI protocols
- Sample cases: True single ventricle, Hypoplastic left heart, Double inlet LV/ RV, Mitral/tricuspid atresia, AV canal defect, Heterotaxy

4. Review and illustration of key factors in anatomic characterization- Atrial situs; Ventricular situs; Great artery relationship, Atrioventricular relationship; AV connection (single, double, or common); AV morphology (straddling/overriding); morphologic LV vs RV; Rudimentary vs functioning ventricles
6. Imaging goals -anatomy, ventricular size, valve function, flow
7. Rationale and role of imaging data in management

SUMMARY

Evaluation of functional single ventricle by MRI requires a thorough understanding of the anatomy and hemodynamics. The purpose of MRI is to delineate the anatomy, physiology and function and to aid in management.

CL-PDE-TU7B • Pediatric Gynecological Masses: Diagnostic Imaging Approach

Ajaykumar C Morani MD (Presenter) ; Khaled M Elsayes MD ; Srinivasa R Prasad MD ; Ramon Sanchez MD ; Farzin Eftekhari MD

PURPOSE/AIM

1. Review the wide spectrum of pediatric gynecologic masses
2. Describe imaging findings of these masses including imaging algorithm and diagnostic approach.

CONTENT ORGANIZATION

Introduction Histogenesis Classification with imaging illustrations A. Gonadal 1. Tumors a. Germ cell tumors (GCTs) ♦ Gonadal ♦ Extragonadal (Sacrocoxygeal, retroperitoneal) b. Non-GCTs ♦ Sex cord stromal tumors ♦ Epithelial tumors c. Miscellaneous (e.g. Metastases, PNET) 2. Non-neoplastic masses a. Ovarian torsion b. Corpus luteum cyst c. Endometriosis B. Uterocervical masses 1. Tumors [e.g. Rhabdomyosarcoma (RMS), PEComa] 2. Non-tumors (Hydrometrocolpos, Endometritis, Mullerian anomaly) C. Vaginal masses 1. Tumors (e.g. RMS) 2. Non-tumors (Hydrocolpos, Mullerian anomaly/cyst) D. Mimics (e.g. mesenchymal, desmoplastic small round cell tumors)

SUMMARY

'Children are not young adults'. Many pediatric gynecologic masses are benign and include hydrometrocolpos, ovarian torsion, mullerian anomalies and endometriosis. One can reach the pertinent differential diagnosis by considering the age, serum markers and distinguishing imaging features of these masses. GCTs constitute majority of pediatric ovarian masses; epithelial and sex cord ovarian tumors occur mostly after age 15. RMS typically involves the vulvo-vaginal region.

Essentials of Pediatric Imaging

Tuesday, 01:30 PM - 03:00 PM • S100AB



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MSES33 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSES33A • Pediatric Airway Emergencies

Jonathan O Swanson MD (Presenter)

LEARNING OBJECTIVES

- 1) Identify the radiographic appearance of common causes of stridor and wheezing in the pediatric population.
- 2) List common radiographic approaches to evaluate pediatric foreign body aspiration.
- 3) Define radiographic-apparent causes of chest pain in the pediatric population.

MSES33B • Imaging of Osteomyelitis in Children

Diego Jaramillo MD, MPH (Presenter)

LEARNING OBJECTIVES

- 1) Recognize that there have been epidemiological changes with significant implications for imaging of musculoskeletal infections in children, particularly with Staphylococcal infections increasingly presenting with subperiosteal and soft tissue abscesses, multifocal disease and deep venous thrombosis.
- 2) Recognize the imaging findings in pediatric osteomyelitis and the important differential diagnostic considerations.
- 3) Be aware of the contribution of the different imaging modalities in the evaluation of pediatric musculoskeletal infections.
- 4) Be familiar with imaging algorithms for the different types and scenarios of children with musculoskeletal infections.

ABSTRACT

Acute hematogenous osteomyelitis is the most common musculoskeletal infection in children. More than half of osteomyelitis affect children below five years of age with 70% involvement of the lower extremities. During the past few years, the incidence of methicillin-resistant Staphylococcus aureus (MRSA) has increased and now accounts for nearly 30% of the cases in children. Multifocal infections, subperiosteal and soft tissue abscess, and deep venous thrombosis are now very prevalent. Hematogenous osteomyelitis usually arises in the metaphysis of long bones or the metaphyseal equivalents of the flat and round bones. Metaphyseal-equivalents are areas adjacent to cartilage that have similar vascularity to that of the metaphyses of long bones. Plain radiographs are primarily used to exclude other pathologies. Ultrasound is important in the detection of subperiosteal and soft tissue abscess. MRI has become the predominant modality for evaluation of osteomyelitis. Gadolinium-enhanced imaging is important in the evaluation of spinal osteomyelitis to exclude epidural and paraspinal collections, in pelvic osteomyelitis to diagnose the abscesses which are prevalent in this infection, and in epiphyseal cartilage infections which may only be visible after contrast administration. Otherwise, contrast material is mainly helpful in increasing the confidence of a diagnosis of a drainable collection. CT scanning is not used routinely but may help in complex cases of chronic osteomyelitis. PET/CT is useful in determining whether a chronic infection is active. The role of bone scintigraphy has declined as evaluation of extra-skeletal findings has become more important, but it is still useful in younger children where the focus of infection is not clinically localizable and in patients who cannot be sedated for MRI.

MSES33C • Cardiac CT in Children Beyond the Coronaries: Why, How, and When?

Catherine M Owens MD (Presenter)

LEARNING OBJECTIVES

- 1) To understand the role of Cardiac CT in children, with particular emphasis on the conditions where CT has a synergistic role e.g. when there is important associated tracheobronchial and pulmonary parenchymal pathology.
- 2) To illustrate specific conditions where CT has a major role in diagnosis and follow up.
- 3) To describe the techniques for acquisition of cardiothoracic CT images which are 'fit for purpose' and acquired at low radiation dose.
- 4) To discuss the various types of acquisition and compare image quality versus effective radiation dose.

ABSTRACT

Pediatric Radiology Series: Advanced Pediatric Abdominal Imaging

Tuesday, 03:00 PM - 06:00 PM • S102AB

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VSPD32 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Daniel J Podberesky, MD *

Moderator

Philip R John, MBBCh, FRCR

VSPD32-01 • Advanced Pediatric Liver MR Imaging Techniques: Elastography and Liver Iron Quantification

Daniel J Podberesky MD (Presenter) *

LEARNING OBJECTIVES

1) Learn the basic principles of MR elastography. 2) Understand how to apply liver MR elastography techniques to a pediatric population. 3) Understand the role that liver MR elastography plays in the clinical evaluation and surveillance of liver fibrosis and inflammation. 4) Review the physiology of iron homeostasis and the pathophysiology of iron overload. 5) Learn the basic principles of liver iron concentration determination using MRI. 6) Learn how liver iron concentration determination by MRI is clinically used in the pediatric population.

ABSTRACT

VSPD32-02 • Liver Stiffness Evaluation Using Acoustic Radiation Force Impulse (ARFI) Measurement in Children: Biliary Atresia Patients vs. Healthy Children

Mi-Jung Lee (Presenter) ; Myung-Joon Kim ; Hye Kyung Chang ; Seok Joo Han

PURPOSE

To evaluate stiffness of liver and spleen in children using acoustic radiation force impulse (ARFI) imaging, to correlate shear wave velocity (SWV) of liver with transient elastography (TE) and aspartate aminotransferase-to-platelet ratio index (APRI), and to correlate SWVs of liver and spleen with the presence of esophageal varices.

METHOD AND MATERIALS

Children with biliary atresia (BA group) and sex- and age-matched healthy children (control group) underwent abdominal ultrasonography and ARFI. SWVs were measured using a 4-9 MHz linear probe for children under 5 years old and a 1-4 MHz convex probe for older children. Three valid SWV measurements were acquired for liver and spleen in each patient. SWVs of liver and spleen, spleen size, TE scores, APRI, and the presence of esophageal varices were evaluated. Linear mixed model with random effects were used to analyze SWVs.

RESULTS

Both group included thirty-two patients (M:F=10:22; age 0.3-15, mean 4 years old). Height, weight, and body mass index were not different between two groups. The mean SWVs of liver was 2.45 m/s in BA group and 1.14 m/s in the control group (p

CONCLUSION

SWVs of liver and spleen increased in children with biliary atresia compared with healthy children. And the SWVs of liver correlated with TE scores. However, SWVs of liver and spleen was not helpful to predict the presence of esophageal varices.

CLINICAL RELEVANCE/APPLICATION

SWVs of liver increased in children with biliary atresia and correlated with TE scores. However, SWVs of liver and spleen was not helpful to predict the presence of esophageal varices.

VSPD32-03 • Diagnostic Accuracy of Ultrasonography (US) Examination for the Evaluation of Nutcracker Syndrome (NS): Comparison with Multidetector-row Computed Tomography (MDCT) as a Reference Standard

Minho Park MD (Presenter) ; Sung Kyung Moon ; Seong Jin Park MD, PhD ; Joo Won Lim ; Dong Ho Lee MD ; Young Tae Ko MD, PhD

PURPOSE

To assess the diagnostic accuracy of US for the evaluation of pediatric NS patients with urinalysis abnormality (UA) compared with MDCT as a reference standard.

METHOD AND MATERIALS

This study included 66 pediatric patients with UA who underwent MDCT and US for the past 7 years. Eighteen patients with other biopsy-proven or clinically diagnosed renal diseases were excluded. MDCT and US images of 48 patients were reviewed retrospectively. By CT, AP diameters of the left renal vein (LRV) at the hilum (CDh) and aortomesenteric space (AMS, CDa) and the diameter ratio (CDh/a) were assessed. The presence of a beak sign of LRV at AMS and corticomedullary enhancement difference between both kidneys (CMD) in the portal phase were assessed. Patients were grouped as Gr 1 (high NS probability) and Gr 2 (low NS probability) according to the following CT criteria: 1) CDh/a>4; 2) presence of beak sign; and 3) presence of CMD. Patients with two or more criteria were categorized as Gr 1. By US, the AP diameters of LRV at the hilum (UDh) and AMS (UDa), diameter ratio (UDh/a), flow velocity at the hilum (Vh) and AMS (Va), and flow velocity ratio (Vh/a) were assessed. Twenty-four-hour urine proteinuria tests and US parameters were compared using an independent t-test.

RESULTS

Gr 1 and 2 comprised 30 and 18 patients, respectively. The mean CDh, CDa, and CDh/a in Gr 1 were 9.9±1.2 mm, 1.9±0.5 mm, and 5.9±3.2 mm, respectively. The mean CDh, CDa, and CDh/a in Gr 2 were 9.0±1.5 mm, 2.9±0.8 mm, and 3.4±1.1 mm, respectively. A significant difference existed in the 24-h urine proteinuria level between the groups (216.3±49.0 mg/d in Gr 1 vs. 133.4±58.8 mg/d in Gr 2; P<0.05). Vh, Va, and Vh/a showed no significant difference (Gr 1 vs. Gr 2: 22.5±7.6 cm/s vs. 22.0±6.7 cm/s, 135.0±30.4 cm/s vs. 122.1±37.7 cm/s, and 7.8±9.0 cm/s vs. 5.9±2.3 cm/s, respectively; P>0.05).

CONCLUSION

Based on MDCT, precise diagnosis of NS by US is difficult. Thus, US should be performed with care in patients who may have NS.

CLINICAL RELEVANCE/APPLICATION

When NS is doubtful in US, MDCT should be considered for a more accurate diagnosis, even in pediatric patients.

VSPD32-04 • Quantification of Liver Fat Content in Adolescents with Non-alcoholic Fatty Liver Disease: Comparison of Triple-Echo Chemical Shift Gradient-Echo Imaging and in Vivo Proton MR Spectroscopy

Rossella Di Miscio ; Lucia Pacifico ; Michele Di Martino (Presenter) ; Concetta V Lombardo ; Flavio Ferraro ; Claudio Chiesa ; Carlo Catalano MD

PURPOSE

To compare a triple-echo gradient-echo sequence for measuring the fat content of the liver with using hydrogen 1 (1H) magnetic resonance (MR) spectroscopy and liver biopsy as the reference standard.

METHOD AND MATERIALS

In 74 pediatric patients with (42 men, 34 women; mean age, 11 years), 3.0-T singlevoxel point-resolved 1H MR spectroscopy of the liver (Couinaud segment VII) was performed to calculate the

liver fat fraction from the water (4.7 ppm) and methylene (1.3 ppm) peaks, corrected for T1 and T2 decay. Liver fat fraction was also computed from triple-echo (consecutive in-phase, opposed-phase, and in-phase echo times) breathhold spoiled gradient-echo sequence (flip angle, 20°), by estimating T2* and relative signal intensity loss between in- and opposed-phase values, corrected for T2* decay. Pearson correlation coefficient, Bland-Altman 95% limit of agreement.

RESULTS

Mean fat fractions calculated from the triple-echo sequence and 1H MR spectroscopy were 6% (range, 0.9%–24.4%) and 14% (range, 3%–43%), respectively. Mean T2* time was 14.7 msec (range, 5.4–25.4 msec). Pearson correlation coefficient was 0.89 (P .0001). With the Bland-Altman method, all data points were within the limits of agreement.

CONCLUSION

A breath-hold triple-echo gradient-echo sequence with a low flip angle and correction for T2* decay is accurate for quantifying fat in segment VII of the liver. Given its good correlation and concordance with 1H MR spectroscopy, this triple-echo sequence could replace 1HMR spectroscopy in longitudinal studies.

CLINICAL RELEVANCE/APPLICATION

A breath-hold triple-echo gradient-echo sequence with a low flip angle and correction for T2* decay is a reliable tool for the quantification of liver steatosis in adolescents with NAFLD

VSPD32-05 • Vitamin E Effect Monitoring with Hepatic Fat Quantification MR in Pediatric Nonalcoholic Steatohepatitis

Mi-Jung Lee (Presenter) ; **Myung-Joon Kim** ; **Hong Koh**

PURPOSE

To evaluate the possibility of Vitamin E effect monitoring with hepatic fat quantification MR in pediatric nonalcoholic steatohepatitis.

METHOD AND MATERIALS

We retrospectively reviewed pediatric patients who received Vitamin E for nonalcoholic steatohepatitis and underwent hepatic fat quantification MR in last three years. Hepatic fat fraction (%) was measured using dual- and triple-echo gradient-recalled-echo sequences at 3T. Compliance group and non-compliance group for Vitamin E medication were compared clinically, biochemically, and radiologically. Continuous variables were analyzed with Mann-Whitney U test and categorical variables were analyzed with Fisher's exact test.

RESULTS

Twenty-seven patients (M:F=24:3, age 12 ± 2.3 years) were included with 22 in compliance group and five in non-compliance group. Baseline findings on all parameters were not different between two groups except triglycerides level (compliance vs. non-compliance group, 167.7 mg/dl vs. 74.2 mg/dl; p=0.001). In compliance group, high-density lipoprotein increased and all the other parameters decreased after medication. However, there were variable changes in non-compliance group. On comparing compliance and non-compliance group, there were significantly different change in dual fat fraction (-19.2% vs. 4.6%; p

CONCLUSION

Hepatic fat quantification MR is a useful tool for monitoring Vitamin E effect in pediatric nonalcoholic steatohepatitis. It can also help to avoid unnecessary biopsies in these patients.

CLINICAL RELEVANCE/APPLICATION

Hepatic fat quantification MR is a useful tool for monitoring Vitamin E effect in pediatric nonalcoholic steatohepatitis. It can also help to avoid unnecessary biopsies in these patients.

VSPD32-06 • Systematic Approach to Imaging Pediatric Liver Masses

Sudha A Anupindi MD (Presenter)

LEARNING OBJECTIVES

1) Identify the common and developing imaging techniques to evaluate liver masses in children. 2) Demonstrate an understanding of the clinical presentation, laboratory findings and imaging features of the most common pediatric liver tumors. 3) Apply these principles to distinguish benign from malignant hepatic tumors.

ABSTRACT

1. Identify the common and developing imaging techniques to evaluate liver masses in children.
2. Demonstrate an understanding of the clinical presentation, laboratory findings and imaging features of the most common pediatric liver tumors.
3. Apply these principles to distinguish benign from malignant hepatic tumors.

VSPD32-07 • Correlation between Bowel Ultrasound and Magnetic Resonance Enterography in Children

Tahani M Ahmad MD (Presenter) ; **Oscar M Navarro** MD ; **Mary-Louise C Greer** MBBS, FRANZCR

PURPOSE

Introduction: Inflammatory bowel disease (IBD) is one of the most common gastrointestinal diseases affecting pediatric population in developed countries. Imaging is a crucial component of disease evaluation. Magnetic resonance enterography (MRE) is becoming the most widely accepted imaging modality in current practice although with some drawbacks including high cost, limited availability and long scan times *Aim:* To compare the diagnostic yield and concordance of bowel ultrasound (US) with MRE in children

METHOD AND MATERIALS

Prospective study in 33 children undergoing clinically indicated MRE. A dedicated bowel US was performed within 2 hours prior to MRE. Each of the US and MRE images were analyzed blindly by two pediatric radiologists. Inter-reader agreements of nine inflammatory markers for each modality and for each bowel segment were calculated as well as the coefficient of concordance between the consensus US and consensus MRE

RESULTS

US showed substantial inter-reader agreement on large bowel and distal ileum but no agreement in the remainder of small bowel. MRE also showed excellent agreement on all bowel segments but moderate on the proximal small bowel. When consensus US was compared to MRE, US showed excellent diagnostic performance in replicating MRE results in most of the large bowel and distal ileum and showed moderate concordance in the remainder of the small bowel and transverse colon.

CONCLUSION

US is a reliable tool and showed substantial correlation with MRE in detecting inflammatory changes in the colon, terminal ileum and distal ileum. US remains inferior to MRE for the remainder of the small bowel with less reliability but moderate concordance. Therefore, US can be an excellent complement to MRE particularly for follow-up of disease activity in patients with known IBD and as a primary imaging method for those with nonspecific symptoms or with low-suspicion for having IBD at initial presentation.. MRE remains the preferred method for evaluating disease involvement at presentation.

CLINICAL RELEVANCE/APPLICATION

Ultrasound is an excellent complement to MRE in evaluation of IBD in children and is recommended for follow-up of disease activity in

patients with known IBD

VSPD32-08 • Diffusion-weighted MR Imaging (DWI) for Detection of Bowel Inflammation in Pediatric Patients with Inflammatory Bowel Disease

Kiran M Sargar MBBS,MD (Presenter) ; **Simon C Kao** MD ; **Geetika Khanna** MD,MS ; **Yutaka Sato** MD

PURPOSE

1. To determine the feasibility of diffusion weighted magnetic resonance imaging (DWI) in the detection of bowel inflammation in patients with inflammatory bowel disease. 2. To evaluate the changes in apparent diffusion coefficient (ADC) values in the inflamed bowel in patients with inflammatory bowel disease.

METHOD AND MATERIALS

We retrospectively analyzed 44 pediatric patients (ages between 10 to 17 years) with either known or clinically suspicious diagnosis of inflammatory bowel disease who underwent MR Enterography (including free breathing DWI). All of these 44 patients had colonoscopy and biopsy within 4 weeks of MR examination. Two radiologists reviewed DWI and ADC maps to evaluate for inflammation in each bowel segment (terminal ileum, cecum, ascending colon, transverse colon, descending colon, and rectosigmoid colon) and measured the ADC values of each bowel segment. Endoscopic and pathologic results were correlated with DWI findings.

RESULTS

Out of 44 patients 7 patients had normal results on endoscopy , pathology and DWI, 27 patients had Crohn's disease (CD) and 10 patients had ulcerative colitis (UC). Among 27 patients with CD, 5 patients had negative endoscopy and pathology and negative DWI. In remaining 22 patients with CD who had positive endoscopy and pathology, DWI detected involved segments of bowel in 19 (86 %). Out of 10 patients with UC, 2 patients had negative endoscopy and pathology as well as negative DWI. Among 8 patients with UC who had positive endoscopy and pathology, DWI detected inflammation in 6 patients (75 %). On DWI, bowel segments with inflammation revealed higher signal. On quantitative analysis, ADC values of inflamed and normal bowel were measured and ADC values in inflamed bowel were significantly decreased as compared with normal bowel. The mean ADC value of proven inflamed bowel was 1.13×10^{-3} mm²/s (range, 0.81×10^{-3} to 1.41×10^{-3} mm²/s), compared to 2.74×10^{-3} mm²/s (range, 1.5×10^{-3} to 4.03×10^{-3} mm²/s) in normal bowel segments (P < .0001).

CONCLUSION

DWI is a valuable imaging tool for detection of bowel inflammation in pediatric inflammatory bowel disease. Sensitivity of DWI is better in CD than UC. ADC values are significantly low in inflamed bowel segments than normal bowel segments.

CLINICAL RELEVANCE/APPLICATION

DWI facilitates fast, accurate and comprehensive workup in pediatric inflammatory bowel disease; without the need for IV contrast administration and eliminating risk of radiation.

VSPD32-09 • MR Colonography including Diffusion Weighted Imaging (DWI) in Children with Inflammatory Bowel Disease (IBD): Do We Really Need Intravenous Contrast?

Sonja Kinner MD (Presenter) ; **Maria L Hahnemann** MD ; **Bernd Schweiger** * ; **Thomas C Lauenstein** MD ; **Selma Sirin** MD

PURPOSE

MR colonography (MRC) is a well-accepted, non-invasive imaging modality for the depiction of inflammatory bowel disease. Diffusion weighted Imaging (DWI) has been shown to show lesions in abdominal MRI as good as contrast enhanced imaging and can also be used for bowel imaging. The aim of this study therefore was to assess if contrast enhancement is really needed to depict inflammatory lesions in bowel MRI if DWI is available.

METHOD AND MATERIALS

38 patients (18 girls, 20 boys, mean age 14.6 years) underwent MRC on a 1.5T (Magnetom Avanto, Siemens). In addition to T2-weighted and contrast-enhanced T1-weighted (ce-T1-w) data, DWI sequences in axial and coronal plane (b = 50, 500, 1000) were acquired and ADC maps were calculated. Two reviewers evaluated i) DWI, ii) ce-T1-w MRC as well as iii) DWI and ce-T1-w MRC concerning lesions (1=none, 2=one/continuous lesion(s), 3= multiple, discontinuous lesions). Furthermore, bowel distension (1=good, 2=moderate, 3=poor distension) and the preferred b-value (0, 500, 1000) were assessed and correlated. Colonoscopy was performed in the following 48 hours and served as reference standard.

RESULTS

Ce-T1-w MRC showed lesions correctly in 32 of 38 patients. All 38 patients were diagnosed correctly with the DWI data set and with a combination of DWI and ce-T1-w MRC. In 4 patients DWI presented multiple, discontinuous lesions, while ce-T1-w MRC only showed one continuous lesion. Inflammatory bowel parts were detectable even if bowel distension was suboptimal: The missed lesions in ce-T1-w MRC were found in patients with only poor or moderate distension. Kappa values for the two readers were excellent (k=0.82). A combination of the two higher b-values (b=500 and 1000) was preferred for DWI.

CONCLUSION

DWI of the bowel shows inflammatory lesions with high accuracy and proved to show lesions that were not seen with ce-T1-w imaging. DWI can be used even in moderately or poorly distended bowel segments and is able to discriminate between one or more continuous or discontinuous lesions. B-values of 500 and 1000 should be used.

CLINICAL RELEVANCE/APPLICATION

DWI seems to be able to replace, in any case complement ce-T1-w MRC. This could be used for short examinations for therapy response assessments and has to be evaluated in future trials.

VSPD32-10 • Relationship of the Detection Rate of Active Pediatric Ulcerative Colitis (PUC) and the Time Interval between MR Enterography (MRE) and Endoscopy

Mohamed A Aggag MD (Presenter) ; **Jorge H Davila Acosta** MD ; **Carmen Rotaru** PhD ; **Ericc Benchimol** MD ; **David Mack** MD

PURPOSE

1. To correlate DWI and post gadolinium enhancement (PGE) findings with endoscopy findings in PUC
2. To evaluate the relationship of detection of active PUC and time interval between the MRE and endoscopy

METHOD AND MATERIALS

Retrospective study. Inclusion criteria: Newly diagnosed patients with PUC who underwent MRE and endoscopy between Feb 2010 and Dec 2012. Exclusion criteria: Interval time between studies > 31 days.

Bowel was divided in 6 segments: Cecum (Ce), ascending colon (AC), transverse colon (TC), descending colon (DC), sigmoid colon (SC) and rectum (Re). MRE was performed in a 1.5 T Magnet. 3 planes SSFSE, axial 2D FIESTA, coronal multiphase 2D FIESTA, coronal and axial DWI b=1000, pre and post gadolinium coronal Dynamic multiphase LAVA fat sat and Axial LAVA fat sat were acquired.

DWI was positive if high SI in DWI and low SI in ADC map. PGE was positive if there was avid mucosal enhancement in comparison with the remainder of the small bowel.

Endoscopy was positive if ulceration, inflammation or edema were documented.

Sensitivity (Se) and specificity (Sp) were calculated in 2 phases. Phase 1 included patients with interval < 15 days and phase 2 included all the patients. Regression logistic analysis for the detection of active PUC and time interval between DWI and endoscopy was calculated in Odds ratios for each segment per week.

RESULTS

18 cases in total, 10 in phase 1. Endoscopy was positive in all Re, SC, DC and TC. Decreased Se between phase 1 and 2 for DWI were:

Ce 1.0 to 0.67, AC 0.78 to 0.59, TC 0.90 to 0.56, DC 1.0 to 0.72, SC 0.8 to 0.61 and Re 0.8 to 0.6. And for PGE were Ce 0.57 to 0.33, AC 0.44 to 0.29, TC 0.5 to 0.33; DC 0.6 to 0.5, SC 0.4 to 0.33 and Re 0.4 to 0.33.
Sp for PGE and DWI were 1.0 in both phases in Ce and AC.
Decreased Odds ratios per week for detection of active PUC by DWI were seen as follows: Ce: 0.25 (p=0.04), AC: 0.56 (p=0.12), TC: 0.21 (p=0.02), DC: 0.12 (p=0.03), SC: 0.42 (p=0.04), Re: 0.42 (p=0.04).

CONCLUSION

1. The longer the interval between MRE and endoscopy, the lower the detection ratio of active PUC by MRE, this is likely due to treatment response.
2. DWI has better sensitivity than PGE in the detection of active PUC.

CLINICAL RELEVANCE/APPLICATION

These results support that treatment contributes to mucosal healing; therefore, correlation value of endoscopy and MRE is lower in longer time interval, for being considered during MRE interpretation.

VSPD32-11 • IR of Challenging Pediatric Liver Conditions

Philip R John MBBCh, FRCR (Presenter)

LEARNING OBJECTIVES

1) To understand the range of hepatobiliary disorders where invasive imaging is required (using vascular and nonvascular interventional techniques). 2) To describe the spectrum of hepatobiliary disorders where IR plays an important role in patient management (hepatic vascular malformations, vascular shunts, transplant issues and the utilization of the liver as a window for cardiac intervention). 3) To emphasize the need for close collaboration and communication between diagnostic and interventional radiology in managing children with hepatobilia.

ABSTRACT

VSPD32-12 • Long-term Outcome of Percutaneous Transhepatic Balloon Dilatation for Anastomotic Stricture at Roux-en-Y Hepaticojejunostomy after Pediatric Living Donor Liver Transplantation

Minoru Yabuta MD (Presenter) ; **Toshiya Shibata** MD ; **Ken Shinozuka** ; **Toyomichi Shibata** MD ; **Hiroyoshi Isoda** MD ; **Kaori Togashi** MD, PhD *

PURPOSE

Living donor liver transplantation (LDLT) has been an established treatment for an end-stage liver disease because of shortage of liver graft. Compared with deceased donor liver transplantation, biliary complications more frequently occur in LDLT. Of biliary complications, anastomotic stricture is most common and might sometimes lead to graft loss. The aim of this study is to evaluate the long-term outcome of balloon dilatation and inner drainage following percutaneous transhepatic biliary drainage (PTBD) for anastomotic stricture at Roux-en-Y hepaticojejunostomy after pediatric LDLT.

METHOD AND MATERIALS

Between April 1997 and December 2012, consecutive 39 patients (15 men and, 24 women, age, 0 - 18 years, median 4 years) who underwent LDLT with Roux-en-Y hepaticojejunostomy developed anastomotic stricture 1 - 218 months (median 8 months) after LDLT. They underwent PTBD, balloon dilatation across the anastomotic stenosis, and inner drainage. After serial exchange with larger diameter tube, drainage tube was removed when biliary stricture was improved on the cholangiography and symptom and biochemical findings were improved clinically. We evaluated tube independent rate, the rate of primary patency, primary assisted patency and secondary patency.

RESULTS

In 38 of 39 patients, a drainage tube could be removed. Tube independent rate was 97%. The rate of primary, primary assisted, and secondary patency at 1-, 3-, 5-, 10-years after the initial PTBD were 0.85, 0.77, 0.74, and 0.74 respectively, 0.97, 0.97, 0.97, and 0.86 respectively, and 1.00, 1.00, 1.00, and 1.00 respectively.

CONCLUSION

Balloon dilatation and inner drainage following PTBD was an effective treatment for anastomotic biliary stricture at Roux-en-Y hepaticojejunostomy after LDLT.

CLINICAL RELEVANCE/APPLICATION

Balloon dilatation and inner drainage following PTBD was an effective in pediatric patients with anastomotic biliary stricture at Roux-en-Y hepaticojejunostomy after LDLT.

VSPD32-13 • Evaluation of the Difference in Radiation Exposure Levels between Image Intensifier and Flat Panel Detector-based Systems in Pediatric Patients with Biliary Strictures Post-liver Transplantation Treated with Interventional Radiological Procedures

Roberto Miraglia MD ; **Luigi Maruzzelli** MD ; **Kelvin Cortis** MD, MRCS, FRCR (Presenter) ; **Fabio Tuzzolino** ; **Roberta Gerasia** ; **Angelo Luca** MD

PURPOSE

The aim of this study was to compare radiation exposure levels between biliary interventional procedures performed using an image intensifier and a flat panel detector-based system in liver transplant pediatric patients with biliary strictures (BS).

METHOD AND MATERIALS

We enrolled 34 consecutive pediatric liver transplant recipients with BS who underwent a total of 170 image-guided procedures in the period between January 2008 and March 2013. The Dose Area Product (DAP) and fluoroscopy time was recorded for each procedure. Mean age was 61 months (range 4 - 192) and mean weight 17 kg (range 4 - 41). The procedures were classified into 3 categories: percutaneous trans-hepatic cholangiography and biliary catheter placement (n=40), cholangiography and balloon dilatation (n=55), cholangiography and biliary catheter change or removal (n=75). Ninety two procedures were performed in an image intensifier-based angiographic system. All of the 78 procedures performed after July 2010 were performed in a flat panel detector-based interventional suite. The difference between the two angiographic systems was compared using the Wilcoxon rank-sum test, using both DAP and fluoroscopy time. The estimates of the differences of DAP adjusted for the fluoroscopy time were assessed with a multiple generalized linear regression model.

RESULTS

Mean DAP in the 3 categories was significantly higher in the group of procedures performed in the image intensifier-based system, as compared to the procedures performed in the flat panel detector-based suite. Statistical analysis revealed a p value of 0.001 in percutaneous transhepatic cholangiogram and biliary catheter placement, 0.0002 in the cholangiogram and balloon dilatation, and 0.00001 in the cholangiogram and biliary catheter change or removal group.

CONCLUSION

In our experience, the use of flat panel angiographic equipment reduces radiation exposure in pediatric biliary interventional radiology procedures in children with liver transplantation.

CLINICAL RELEVANCE/APPLICATION

The use of flat panel angiographic equipment should be considered for pediatric interventional radiology procedures.

VSPD32-14 • Free Breathing Radial 3D VIBE- A Possibility to Perform Dynamic Contrast Enhanced Abdominal MRI Examinations of Children under General Anesthesia with an Improved Image Quality

Maya C Larson (Presenter) ; **Philipp Weisser** MD ; **Renate M Hammerstingl** MD ; **Martin Beeres** MD ; **Kai T Block** ; **Thomas J Vogl** MD, PhD

PURPOSE

To show that a MRI protocol including a free-breathing 3D VIBE sequence with radial k-space sampling allows dynamic contrast enhanced abdominal imaging in sedated and ventilated children undergoing MR scans with improved image quality.

METHOD AND MATERIALS

12 pediatric patients, aged from 2 months to 5 years, referred for clinically indicated contrast enhanced abdominal MRI scans underwent imaging at 1.5T under general anesthesia. The protocol included a free breathing T1 weighted GRE-sequence with radial k-space sampling that was used to acquire three dynamic image series including arterial, portal-venous and hepato-venous phases. Additionally a breath-gated fat suppressed T1 weighted FLASH 2D sequence with rectilinear k-space sampling was performed. All Image series were evaluated by two independent radiologists using a 3-point scale (1 excellent - 2 fully diagnostic - 3 non-diagnostic) regarding overall image quality, special focus was on vessel clarity, distinction of organ parenchyma, artifacts, and- if present- lesions.

RESULTS

The short acquisition time of the free- breathing T1 weighted 3D VIBE Sequence allowed dynamic contrast enhanced imaging in all examined sedated and ventilated patients without ventilation stop. Furthermore the image quality of all three dynamic image series of the free- breathing T1 weighted 3D VIBE sequence was rated with an average of 1.3 and is therefore considered by both radiologists in consensus as superior to the breath-gated T1 weighted FLASH 2D sequence which was rated with an average of 2.2 on a scale of 1-3 (1 excellent 2- diagnostic - 3 non diagnostic).

CONCLUSION

The free breathing T1 weighted radial VIBE sequence allows dynamic contrast enhanced imaging of pediatric patients undergoing MRI examination in general anesthesia and in deep sedation. This kind of examination cannot be performed with a standard breath gated T1-FLASH 2 D sequence without ventilation stop or in deep sedation without intubation. Furthermore as the acquisition times are very short and the radial VIBE proves to be very resistant to motion artifacts, the free-breathing 3D VIBE sequence provides improved image quality compared to the T1 FLASH 2D sequence.

CLINICAL RELEVANCE/APPLICATION

The radial VIBE MRI sequence allows dynamic contrast enhanced imaging of sedated and ventilated children in general anesthesia with an improved image quality and should be therefore recommended.

VSPD32-15 • Free Breathing Fast Pediatric MRI: Quantitative Analysis of View Sharing vs. Locally Low Rank Motion Weighted Reconstructions

Shaun V Mohan MD (Presenter) ; **Tao Zhang** ; **Richard A Barth** MD * ; **Shreyas S Vasanawala** MD, PhD *

PURPOSE

Dynamic contrast enhanced functional renal MRI requires well-registered kidneys over all temporal phases as well as high temporal resolution. Fast MR methods, such as compressed sensing and parallel imaging can significantly shorten scan time. Combined with respiratory motion correction, a locally low rank motion weighted (LLRMW) method may enable free breathing fast multi-phase MRI, potentially decreasing the depth and duration of anesthesia. Here we compare LLRMW and the commonly used view sharing (VS) reconstruction to assess motion artifacts quantitatively through measurements of kidney movement for free breathing MRI.

METHOD AND MATERIALS

With IRB approval, informed consent and HIPAA compliance, 25 pediatric MRI cases (14 male, 11 female, mean age 6) were obtained at our institution for 3T multi-phase DCE MRI with a free breathing acquisition accelerated approximately 6-fold. VS and LLRMW reconstruction were performed. To assess kidney movement, TeraRecon V4.4 was utilized to draw signal profiles across the inferior pole of each renal cortex and adjacent fat. Two patients only had one native functional kidney on which measurements were performed (N=48). The resulting curve indicated the transition in signal strength between the kidney and fat, correlating with the margin of the kidney, and was captured across all 18 temporal phases of the study to assess kidney movement over time. The greatest change between profile transition points indicated the greatest movement for each kidney for both reconstructions.

RESULTS

A paired t-test was performed on the measurements for the left and right kidneys respectively, comparing VS and LLRMW reconstructions. The mean difference calculated greater overall motion in the VS than LLRMW reconstruction, with 0.5067 mm (95% CI: 0.2719 to 0.7415) for the left kidney and 0.5688 mm (95% CI: 0.3050 to 0.8325) for the right kidney with p values < 0.005.

CONCLUSION

LLRMW reconstruction of fast MRI on free breathing patients results in significantly reduced kidney movement as perceived on MRI than a VS reconstruction. Further analysis would include an expert review of the two reconstructions to assess for subjective viewer preference of quality and clinical utility.

CLINICAL RELEVANCE/APPLICATION

Determining the optimal reconstruction for under sampled MRI capture data would help establish a protocol for fast MRI of free breathing children, and facilitate quantitative DCE analysis.

Interactive Game: Pediatric CNS Disorders

Tuesday, 04:30 PM - 06:00 PM • E451B

PD NR

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RC405 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Erin S Schwartz, MD

LEARNING OBJECTIVES

This interactive session will use RSNA Diagnosis Live. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

RC405A • Fetal and Neonatal Brain Disorders

Ellen Grant MD (Presenter)

RC405B • Phakomatoses in Children

Gilbert Vezina MD (Presenter)

LEARNING OBJECTIVES

1) Define the imaging characteristics of the common phakomatoses. 2) Understand the underlying genetic/molecular basis of the imaging findings in the phakomatoses.

ABSTRACT

Presentation summary:

The presentation will review the clinical and imaging findings of the common phakomatoses, primarily neurofibromatosis type 1 and 2, tuberous sclerosis complex, von Hippel-Lindau disease, and Sturge-Weber. The phakomatoses, also known as the neurocutaneous syndromes, are a heterogeneous group of disorders characterized by multiple hamartomas and other congenital malformations affecting mainly structures of ectodermal origin. Many are inherited through autosomal dominant means. The underlying genetic abnormalities that cause most of the phakomatoses are well-characterized, leading to a good understanding of the genotype-phenotype correlation. In most cases, the loss of a suppressor activity results in proliferation of normal and abnormal cells. This leads to the characteristic hamartomas and neoplasms seen in many of the phakomatoses.

RC405C • Pediatric CNS Cases

Susan L Rebsamen MD (Presenter)

LEARNING OBJECTIVES

1) To familiarize the diagnostic radiologist as well as the fellowship trained neuroradiologist with the appearance and imaging characteristics of the more commonly encountered developmental brain anomalies as well as other pediatric intracranial pathology. 2) To demonstrate the utility of new technological advances and MRI sequences for the characterization of pediatric intracranial pathology and developmental brain anomalies.

RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

Wednesday, 08:30 AM - 10:00 AM • S402AB

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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

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.

Pediatrics (Imaging)

Wednesday, 10:30 AM - 12:00 PM • S102AB

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SSK18 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1

Moderator

Brian D Coley, MD

Moderator

Geetika Khanna, MD,MS

SSK18-01 • The Role of Subdural Hygromas for the Diagnosis of Shaken Baby Syndrome: A Retrospective CT and MRI Study in Children between 0 and 2 Years

Maria L Hahnemann MD (Presenter); **Bernd Karger**; **Sonja Kinner** MD; **Marc U Schlamann**; **Michael Forsting** MD; **Heidi Pfeiffer**; **Daniel Wittschieber**

PURPOSE

Abusive head trauma (AHT) represents a leading cause of death in infants. The significance of traumatic subdural hygromas (SDHy) in AHT, especially in shaken baby syndrome, is not well understood and still a matter of debate. The present study investigates the origin and characteristics of SDHy by modern imaging techniques.

METHOD AND MATERIALS

The image material of all children between 0 and 2 years, who were suspected to have a craniocerebral injury and had an initial cranial computer tomography at the University Hospital Essen, were analyzed retrospectively from the years 1999 to 2012. In cases where additional MR examinations existed, these MR images were also analyzed. First, the demographic and anamnestic data were recorded. Second, the radiological co-findings were analyzed. Third, we searched for criteria indicating AHT as origin of SDHy.

RESULTS

The inclusion criteria detailed above were met by 136 cases. In 33 cases an AHT was assumed from the total of clinical, forensic, and criminalistic findings. 17 cases showed evidence of SDHy. In only one SDHy case, there was adequate accidental trauma anamnesis. The demographic data and the radiologic findings in cCT and cMRI will be presented. The classification scheme by Zanini et al. (2008) is not suitable. Instead, for indicating AHT as cause of SDHy, the presence of bridging vein thromboses appears to indicate a high degree of violence and thus, in the absence of adequate accidental trauma, the presence of AHT.

CONCLUSION

There are different SDHy appearances which allow for conclusions to the mechanism of causation. Therefore, neuroradiologists should be aware of the possible presentations of AHT. The presence of bridging vein thromboses indicates AHT.

CLINICAL RELEVANCE/APPLICATION

Although difficult to investigate, understanding of SDHy may allow for new insights into the pathogenesis of phenomena such as the shaken baby syndrome.

SSK18-02 • Semi-quantitative Evaluation of Neuroblastoma Tumor Burden Using 123I-MIBG and 18F-FDG PET/CT

Khun Visith Keu MD,FRCPC (Presenter); **Claire Twist** MD; **Andrew Quon** MD; **Erik S Mittra** MD, PhD; **Andrei Iagaru** MD *

PURPOSE

Metaiodobenzylguanidine radiolabeled with I-123 (mIBG) is routinely used for assessing neuroblastoma (NB), but 18F-FDG PET/CT (FDG) are used in indeterminate situation where undifferentiated histology or aggressive tumor behavior is suspected. The purpose of this study was to evaluate the correlation of semi-quantitative analysis of FDG to mIBG scoring system in high-risk NB patients.

METHOD AND MATERIALS

We retrospectively reviewed pediatric patients who were referred to our institution from 2003 to 2011, and who underwent mIBG and FDG studies within 3 weeks, for staging, monitoring response to therapy or surveillance. Patients who had treatment or surgical procedure between the two studies were excluded. On mIBG, the severity of disease extent was evaluated at 10 different anatomic locations, using a scoring scale of 0 to 3, known as the Curie Score (CS). On FDG, estimated threshold delimitation was used to calculate the five largest and distinct lesions: SUVmax, SUVmean, MTV (metabolic tumor volume) and TLG (total lesion glycolysis = MTV x SUVmean) were extracted from each scan. The CS on mIBG was correlated with the sum of TLGs on FDG, using a Spearman rank test.

RESULTS

Twenty-one patients were assessed with mIBG and FDG scans: in 7 patients, the pair studies were not performed within 3 weeks and/or treatment was administered before the second scan. Only fourteen pediatric patients (6 men, 8 women) with an average age (±SD) of

104 (± 80) months were eligible for further analysis. The median (and interquartile range = IQR) of CS and sum of TLGs were respectively 2 (IQR = 1 \diamond 12) and 38 (IQR = 6 \diamond 156). Both semi-quantitative scoring systems were correlated but not significantly, with a $\rho = 0.514$ and $P = 0.06$. One third of patients were lost after one year follow-up. In the other two thirds, all patients with CS > 1 died shortly after the imaging (< 18 months survival) and most patients with a sum of TLGs > 10, died without reaching a 2 years survival post-scan.

CONCLUSION

CS on mIBG and sum of TLGs on FDG scans provide similar information on tumor burden in high-risk NB patients. These data suggests also that mIBG might be better in identifying patients with poor outcome. This is the first study we know of that compares the tumor burden semi-quantitatively on mIBG and FDG scans.

CLINICAL RELEVANCE/APPLICATION

Prognostic value of each scan is better defined with standardize and reproducible semi-quantitative scoring systems.

SSK18-03 • Correlation of 18F FDG Activity and Gd-contrast Enhancement of Pediatric Tumors on PET/MR: The Next Step towards "One Stop Shop" Tumor Staging

Christopher Klenk MD (Presenter) ; Rakhee S Gawande MD ; Vythao Tran MD ; Sandy Napel PhD * ; Andrew Quon MD ; Heike E Daldrop-Link MD

PURPOSE

MRI is the modality of choice for local staging of many solid malignancies in pediatric patients. 18F FDG-PET/CT is often complemented for whole body staging. Integrated PET/MR can combine local and whole body staging in one imaging exam while eliminating the CT portion of a PET/CT. The purpose of this study was to determine the need for administering contrast for local tumor staging with PET/MR by comparing tumor areas of increased 18-FDG metabolic activity with areas of Gd-enhancement.

METHOD AND MATERIALS

We retrospectively evaluated imaging studies of 35 children (age 1-18 years, mean 9.9 years) with small round blue cell tumors, who had undergone an 18F-FDG PET/CT and gadopentetate-enhanced MRI with an interval of less than three weeks. Patients in remission or with brain tumors were excluded. 18F-FDG PET and Gd-enhanced MR scans were color encoded and fused using Osirix software. A pediatric radiologist and nuclear medicine physician evaluated the concordance or discordance of 18F-FDG and Gd-tumor enhancement in consensus. Results were compared using the McNemar's Test.

RESULTS

29/35 patients had regions of tumor that demonstrated avid contrast enhancement that correlated with regions of significant FDG avidity (83%). 6/35 patients had areas of contrast enhancement that was discordant with regions of FDG avidity (17%). The McNemar's Test demonstrated a significant correlation between 18F-FDG and Gd-tumor enhancement.

CONCLUSION

PET/MR as a combined imaging modality is highly effective for staging and restaging of pediatric malignancies when used as a combined imaging modality and would allow for "one stop shop" tumor staging. There is a high concordance between areas of increased 18-FDG avidity on PET with areas of GD-enhancement on MRI in small cell tumors. Thus, MR contrast agent administration may not be needed and should be assessed on a patient-by-patient basis.

CLINICAL RELEVANCE/APPLICATION

PET-MR as a combined imaging modality is highly effective for staging and restaging of pediatric malignancies which allows "one stop shop" tumor staging and significantly reduces radiation exposure.

SSK18-04 • Comparison of Multivoxel MR Spectroscopy and I-123 MIBG Findings in Neuroblastoma

Zakir Sakci MD (Presenter) ; Yonca Anik MD ; Ahmet Akca ; Mehmet Gencturk MD ; Ali Demirci MD ; Hakan Demir ; Gozde Da?oz Gorur ; Funda Corapcioglu

PURPOSE

In neuroblastoma patients who have tumor residue after treatment the use of conventional MRI provides limited information regarding the maturity of the tumor. For this reason, we use I-123 Metaiodobenzilguanidin (MIBG) to evaluate the tumor for maturity before prescribing further treatment. We can learn about the current membrane turnover by looking at the MR Spectroscopy maturity levels along with the peak of cholin. We can analyze the cholin peaks at finer detail with the use of multivoxel MR spectroscopy. The aim of our study was to evaluate tumor activation with MRS and compare the findings with that of I-123 MIBG.

METHOD AND MATERIALS

We included twenty patients diagnosed pathologically proven with neuroblastoma. MR imaging was done via 3T MR device before treatment and during treatment intervals> Multivoxel spectroscopy was performed with TE: 140. Cholin peak and choline/creatine ratio were measured. I-123 MIBG was also performed. Uptake was graded as 4 grade on I-123 MIBG. Time interval between both modalities was at most 10 days. In all patients primary tumor was imaged and in three patients metastatic lesions were also imaged. Cholin peak and choline/creatine ratio and MIBI grade were correlated.

RESULTS

We demonstrated choline peak in all I-123 MIBG active tumors. Correlation among cholin peak and choline/creatine ratio and MIBI grade revealed significant correlations both in primary tumors and metastatic lesions.

CONCLUSION

I-123 MIBG has radiation exposure and is repeated several times during treatments, takes a long time to perform. On the contrary MRS lack radiation, can be performed in about twenty minutes. MRS can provide tumor activation information. MRS may be an alternative technique for I-123 MIBG in near future. Further analysis with larger number of patients is required.

CLINICAL RELEVANCE/APPLICATION

MRS may be an alternative technique for MIBI in near future. MRS lack radiation, to be able to performed in about twenty minutes are advantages to MIBI.

SSK18-05 • Evaluation of Whole Body MRI including Diffusion-weighted and Conventional Unenhanced and Contrast Enhanced Imaging as the Sole Staging and Follow-up Imaging Procedure in Pediatric Tumors Compared to Other Imaging Modalities

Guenther K Schneider MD, PhD (Presenter) * ; Alexander Massmann MD ; Stefan R Rick ; Arno Buecker MD * ; Jonas Stroeder MD ; Peter Fries MD

PURPOSE

In 36 pediatric pts with suspected malignant tumors prediagnosed by other imaging modalities whole body MRI was evaluated as the sole staging procedure including evaluation of the lungs. MRI was compared with established staging procedures such as PET, MIBG or bone scintigraphy, CT and ultrasound. Furthermore findings in follow-up whole body MRI were used for evaluation of tumor response and tumor recurrence, again compared against conventional imaging.

METHOD AND MATERIALS

167 whole body exams in 36 pts were performed for staging / follow-up of different benign and malignant tumors confirmed by histology and/or surgical exploration. In 9 pts benign tumors incl. mature teratoma, liver abscess, hemorrhage, mesothelial cysts, hemangiomas, angiomyolipoma and myofibromatosis were diagnosed, in the remaining 27 pts 8 lymphoma and 19 solid tumors (neuro-, nephro- and hepatoblastoma, different sarcomas) were found. MR protocol incl. T1w dynamic GRE sequences of the abdomen post CM (0,05 mmol/kg BW Gd-BOPTA (MultiHance) and during the liver specific phase. DWI was acquired during free breathing and

transversal T2w TSE sequences with navigator triggering and a composed whole-body STIR-sequence in coronal orientation were acquired.

RESULTS

MRI correctly differentiated between malignant and benign tumors in 35/36 pts. In one patient infantile myofibromatosis was misdiagnosed as rhabdomyosarcoma without metastases. In malignant tumors one rhabdoid tumor was misinterpreted as neuroblastoma but correctly staged and one case of Hodgkin lymphoma was misinterpreted as PNET, again with correct staging. Differences between MRI and CT were seen regarding the number of small lung metastases (< 3mm), however relevant lesions for staging were correctly diagnosed. Recurrent tumors and restaging was correctly facilitated by MRI, sensitivity for detection of small abdominal mets (< 10 mm) was better for MRI as compared with PET imaging. No differences in staging of neuroblastoma were seen between MRI and scintigraphy.

CONCLUSION

Whole body MRI performed with the described technique can correctly stage and diagnose a variety of malignant tumors and further large scale studies have to prove if MRI can finally replace at least some of the actually established staging procedures.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates the potential of whole body MRI using DWI and conventional techniques for complete evaluation of pediatric malignancies.

SSK18-06 • Intussusception Revisited: Is On-site Surgeon Presence at the Time of Radiologic Reduction Necessary?

Haithuy N Nguyen MD (Presenter) ; J. H Kan MD ; R. Paul Guillerman MD ; Christopher I Cassidy MD

PURPOSE

The ACR-SPR clinical practice guidelines recommend that fluoroscopic-guided intussusception reduction be performed with a surgeon readily available. At many institutions, this may not be feasible. The purpose of this study is to assess the utilization of immediate surgical services at the time of radiologic intussusception reduction.

METHOD AND MATERIALS

All radiologic intussusception reductions at a tertiary care children's hospital from 11/07-8/12 were reviewed to determine method, complications, clinical status of the child, and time interval between unsuccessful reduction and operative intervention.

RESULTS

433 intussusceptions were referred for fluoroscopic reduction. 86.1%(N=373) were successful and 13.9%(N=60) were unsuccessful, with 5 perforations representing 8.3%(5/60) of unsuccessful and 1.2%(5/433) of total reduction attempts. Six patients became hemodynamically unstable during attempted reduction (4 perforations, 2 unsuccessful reductions without perforation), representing 10%(6/60) of unsuccessful and 1.4%(6/433) of total reduction attempts. Percutaneous needle decompression and cardiopulmonary resuscitation restored hemodynamic stability in all cases. The mean time to surgery after perforation, unsuccessful reduction complicated by hemodynamic instability, and unsuccessful radiologic reduction without complication was 1.3, 2.2 and 4.3 hours, respectively.

CONCLUSION

In our series, complications requiring immediate medical or surgical attention were rare, occurring in 1.6% of cases (5 bowel perforations and 2 hemodynamically unstable cases without perforation). On-site surgeon presence may not be necessary at the time of radiologic-guided reduction attempts, provided that the radiologist is facile with percutaneous needle decompression and management of hemodynamic instability, and ultimate surgical care can be arranged expeditiously.

CLINICAL RELEVANCE/APPLICATION

The ACR-SPR guidelines should continue to reflect the need for emergent on-call surgical back-up for intussusception reduction attempts, but surgical attendance is not required during the procedure.

SSK18-07 • Prevalence of Developmental Dysplasia of the Hip in Breech Infants after Normal Screening Ultrasound: Is Follow-up Radiography Really Necessary?

Booth Aldred MD (Presenter) ; Henry J Baskin MD ; Brett Weitzel MD

PURPOSE

DDH is a prevalent source of morbidity seen within pediatric orthopedics. A significant amount of discrepancy exists in the literature regarding selective screening and follow-up imaging for the patient at risk for DDH. Current protocol at our institution dictates that all normal ultrasounds in breech infants be followed-up with radiography at four to six months. Yet, the data is conflicted on the value-added by these follow-up radiographs. We evaluate the utility of follow-up radiography in breech infants with initial normal ultrasound findings and determine if radiographs add significant value, justifying their use.

METHOD AND MATERIALS

We performed a systematic review of all breech infants born since 2009 collected from our institution's database. All infant ultrasounds were performed by accredited sonographers utilizing standard techniques. Breech infants with a negative ultrasound at around 6 weeks were included if a follow-up radiograph was performed at approximately 6 months. Then, using standard departmental criteria, we evaluated whether the infant had radiographic findings of DDH or remained normal.

RESULTS

Preliminary screening of approximately 200 breech infants demonstrated 125 infants that met out inclusion criteria. Of these 125 infants, there were 5 infants with radiographic findings of DDH. We expect another 200 to 250 infants to meet inclusion criteria for this study.

CONCLUSION

Preliminary data suggests that breech infants with negative US at 6 weeks have a small but significant risk of DDH diagnosed with radiograph by 6 months of age. Given the severe morbidity of delayed diagnosis of DDH, we suggest radiographic followup of breech children who had normal screening hip ultrasound in the newborn period.

CLINICAL RELEVANCE/APPLICATION

Morbidity associated with DDH in the infant is significant. Our center recently began follow-up imaging in breech infants who had a negative initial ultrasound. Is this imaging necessary?

SSK18-08 • Iterative CT Image Reconstruction Allows Sub-0,1 mSv Effective Dose for the Diagnosis of Craniosynostosis

Caroline Ernst MD ; Tine Hulstaert (Presenter) ; Dries Belsack MD ; Nico Buls DSc, PhD * ; Gert Van Gompel PhD ; Koenraad H Nieboer MD * ; Johan De Mey *

PURPOSE

To evaluate diagnostic quality of markedly lowered dose cranial computed tomography (CT), reconstructed by full model based iterative reconstruction (MBIR), in the diagnosis of craniosynostosis.

METHOD AND MATERIALS

During 2009-2012 48 patients, aged 0- 35 months, underwent cranial 3D CT on a 64 Multidetector CT to assess cranial sutures. In 2009-2010 24 patients were scanned on a Philips system (Brilliance CT 64) with a standard acquisition protocol (120 kVp; 276 mA, fixed) and reconstructed by FBP. In 2011-2012 the other 24 patients underwent a lowered dose CT (80 kVp; 10 mA, fixed) on a Discovery 750HD (GE Healthcare) system using MBIR reconstruction (Veo). CTDIvol and DLP were obtained from the dose report and effective doses were estimated conform current ICRP guidelines. Objective image quality (IQ) was assessed in terms of image noise,

signal-to-noise ratio's (SNR) and sharpness. Subjective IQ assessment by two blinded expert readers was performed by scoring several parameters and structures such as noise, bony structures and overall diagnostic acceptability. Statistical evaluation was performed with independent T-test, non-parametric Mann-Whitney U test and kappa analysis.

RESULTS

CONCLUSION

The use of MBIR in cranial 3D CT allows sub-0,1 mSv effective dose for the diagnosis of craniosynostosis without impairing diagnostic quality.

CLINICAL RELEVANCE/APPLICATION

Implementation of novel CT technologies allows for increased radiation safety in paediatrics.

SSK18-09 • Limited Abdominal Ultrasound for Evaluation of Children with Acute Abdominal Pain

Martha M Munden MD (Presenter) ; Shannon Wai MD ; Michael Distefano MD ; Wei Zhang PhD

PURPOSE

The aim of this study is to determine whether a complete abdominal ultrasound (US) is necessary in the evaluation of children with right lower quadrant (RLQ) pain suspicious for appendicitis in the Emergency Department (ED), and whether performing a limited RLQ US would miss a clinically significant diagnosis.

METHOD AND MATERIALS

This is a retrospective review of 1204 consecutive initial abdominal US studies done from March through December of 2008 for children presenting to a tertiary pediatric ED with abdominal pain concerning for appendicitis. Primarily performed limited ultrasound examinations, and examinations done for those with chronic disease such as cystic fibrosis, and sickle cell disease were excluded. Our limited US examination excludes evaluation of the pancreas, spleen and left kidney. Data were extracted from the complete abdominal US to see if any abnormalities were noted of the pancreas, the spleen and the left kidney, and patients' charts were reviewed to see if any positive findings in these organs were clinically significant.

RESULTS

Of the 704 US examinations included in this study, there were 65 potential missed diagnoses, ie abnormal US findings noted in the pancreas, spleen or left kidney. Only 6 of these findings were clinically significant and 5 were managed medically while 1 (a left ureteropelvic junction obstruction) underwent surgical intervention. The chance of missing a diagnosis is calculated as $65/704 = 9.2\%$ (95% confidence interval: 7.2% - 11.7%) and the chance of missing a diagnosis that is clinically significant is $6/704 = 0.85\%$ (95% confidence interval: 0.35% - 1.94%).

The average time to perform a complete abdominal US exam was 71 minutes and our limited exam required an average of 44 minutes (measured on those patients who had these performed who were not in our study group). The charge for a complete US vs limited US is \$681 vs \$484

CONCLUSION

In children with acute abdominal pain concerning for appendicitis, evaluation with a limited RLQ US provides a timely diagnosis, while missing only 1 case of surgically treatable abdominal pain. The limited US resulted in overall savings in time to perform examination and charges.

CLINICAL RELEVANCE/APPLICATION

By limiting the ultrasound examination, significant time and expense can be saved with the chance of missing a clinically significant diagnosis of only 0.85%.

Pediatric Radiology - Wednesday Posters and Exhibits (12:15pm - 12:45pm)

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CL-PDS-WEA • AMA PRA Category 1 Credit™:0.5

Host

Prakash M Masand , MD

CL-PDS-WE1A • Usefulness of Low-dose Dual-source CT in Infants and Children with Congenital Airway Abnormalities

Haiyan Wang MD (Presenter) ; Bin Zhao MD

PURPOSE

Objectives: To evaluate the clinical value of low-dose dual-source computed tomography (DSCT) in infants and children with congenital airway abnormalities.

METHOD AND MATERIALS

Thirty-six patients (median age: 20 months, mean age: 30.5 months, range: 2 months to 12 years; male 20; mean weight: 14.8kg) with congenital airway abnormalities underwent low-dose DSCT non-enhanced scan or angiography. Bronchoscopy was performed in 29 patients, and surgeries were performed in 9 patients (include 2 patients underwent bronchoscopy and surgery). The accuracy was calculated based on the bronchoscopy and surgical findings. The overall imaging quality was evaluated on a five-point scale.

RESULTS

A total of 40 separate congenital airway abnormalities were confirmed. Three tracheobronchomalacia were missed and one tracheobronchomalacia was misdiagnosed as congenital tracheal stenosis (CTS) by DSCT. The accuracy, sensitivity, specificity, positive predictive value and negative predictive value were 98.0%, 90.0%, 99.5%, 97.3% and 98.1%, respectively. The average subjective image quality score was 4.4 ± 0.8 . The mean dose-length product (DLP) was $17.50 \pm 9.26 \text{mGy.cm}$. The mean effective dose was $0.33 \pm 0.16 \text{mSv}$.

CONCLUSION

Low-dose DSCT with a very low effective radiation dose allows the accurate diagnosis of congenital airway abnormalities in infants and children. It has great promise to become a commonly used technique for congenital airway abnormalities.

CLINICAL RELEVANCE/APPLICATION

low-dose dual-source CT utilizing low radiation dose while ensuring proper image quality in infants and children with congenital airway abnormalities

CL-PDS-WE2A • Application of Dual-source CT with High-pitch Spiral Mode in Pediatric Patients with Congenital Bronchopulmonary Dysplasia and Tracheoesophageal Fistula

Yanhua Duan MD (Presenter) ; Ximing Wang PhD

PURPOSE

To investigate the performance of high-pitch spiral mode for dual-source CT in pediatric patients with congenital bronchopulmonary

dysplasia and tracheoesophageal fistula without breathe holding

METHOD AND MATERIALS

A total of 20 consecutive pediatric patients (age, 30±7.5 days) with suspected tracheal diseases or esophageal diseases underwent 128-slice dual-source CT of the chest in a high-pitch spiral mode, 6 of them performed with enhanced CT, and the other 14 pediatric patients performed with non-enhanced CT scanning. Scan parameters were as follows: pitch=3.0, 2*128*0.6 mm slice acquisition, 0.28 seconds gantry rotation time, care Dose 4D and care kV on. Images were reconstructed with a slice thickness of 0.75 mm and SAFIRE-algorithm. No breathing instructions were given in all pediatric patients, and sedation was administered into the 6 pediatric patients, who underwent enhanced CT, and sedation was not given the other 14 children who underwent non-enhanced CT. Image quality was assessed focusing on motion artifacts and delineation of the vascular structures and the lung. Radiation dose values were calculated from the dose length product provided in the patient protocol. The diagnostic efficacy was confirmed by bronchoscopy, esophagoscopy or surgical findings.

RESULTS

Diagnostic images were obtained in all patients. 5 patients with Tracheal Bronchus; 4 patients with bridging bronchus (pulmonary artery slings were detected in 2 of them), 7 patients with tracheal stenosis (pulmonary artery slings were detected in 3 of them), 2 patients were diagnosed with right bronchus obstruction and pulmonary stenosis, and 2 patients with tracheoesophageal fistula. Compared with bronchoscopy, esophagoscopy or surgical findings, the diagnostic efficacy was 100%. The effective dose was 0.39±0.12 msv

CONCLUSION

High-pitch chest CT is a promising method to provide good image quality making sedation or breath holding for the chest CT examination in pediatric patients unnecessary, whereas maintaining low radiation dose value

CLINICAL RELEVANCE/APPLICATION

High-pitch chest CT is a precise method for pediatric patients with congenital bronchopulmonary dysplasia and tracheoesophageal fistula

CL-PDS-WE3A • Optimizing Imaging Parameters of Neonatal Chest X-ray

Hannele M Niiniviita MSc (Presenter) ; **Erkki J Svedstrom** MD, PhD ; **Jarmo Kulmala** DPH

PURPOSE

Image quality and radiation dose are optimized in imaging chest X-ray of premature infants with variation traditional parameters and extra filters.

METHOD AND MATERIALS

The X-ray unit was Mobilett XP mobile unit (constant filter inside the unit 2.5 mm Al). Fuji sensitive one size image plate HR-V and Fuji FCR Capsula XLII reader was used. The additional filtration was either 1mmAl +0,1mmCu or 1mmAl + 0,2 mmCu. In mobile unit was the own DAP meter. Clinical X-ray imaging was done in department of premature infant. The weight of infants varied from 1000 g to 4000 g. Absolute doses were measured with thermoluminescent dosimeters (TLD) placed in ATOM pediatric phantom (newborn size). The five TLDs were placed on thyroid, lungs (2 pieces), rib, sternum and ovary. The image quality was estimated by five radiologists by comparing two blinded images, where another was taken with and the other without additional filtration. The image quality was compared on 15 image pairs. The radiologist evaluated from images overall impression, parenchyma, pleura and catheter by grading if the quality was as equally good on both images or if one of them was better.

RESULTS

On four image pairs radiologist estimated the images taken with normal parameters and without additional filtration to be better on all disciplines but on the last 11 image pairs at least one radiologist ranked one area to be better at the images taken with additional filtration. But all images were diagnostics. The TLD measured radiation doses varied between 2 to 196 µGy depending on the organ, weight and image parameters. Optimized imaging parameters are found comparing the evaluated image quality and measured organ doses. The DAP values correlated with the absolute dose values.

CONCLUSION

Image quality and radiation dose can be optimized with here presented model and in clinical practise it is possible to find imaging parameters (imaging quality adequate and radiation dose low) according to infant size.

CLINICAL RELEVANCE/APPLICATION

Radiation dose of chest x-ray studies of newborns and prematures can be lowered using additional filtration without loss of diagnostic information.

CL-PDS-WE4A • Can We Diagnose Developmental Dysplasia of the Hip by Measuring Acetabular Epiphyseal Distance? Comparison of the Graf Method with Acetabular Epiphyseal Depth Measurement

Sara R Teixeira MD ; **Vitor F Dalto** MD (Presenter) ; **Orlando S Zoghbi Neto** MD ; **Daniel Maranhão** ; **Jose B Volpon** ; **Marcello H Nogueira-Barbosa** MD, PhD

PURPOSE

To evaluate if the acetabular epiphyseal distance (AED) has feasibility and reproducibility comparable to the Graf method

METHOD AND MATERIALS

A retrospective study from January 2010 to March 2012 included 115 patients (230 hips) at risk for developmental dysplasia of the hip (DDH) and underwent ultrasound (US) evaluation between third and fourth week of life. The Graf modified classification was assessed and the hips were distributed in two groups: non-dysplastic (I, IIA) and dysplastic hips (IIC, III, D, IV). AED in coronal neutral and flexion views was assessed by measuring the distance between the acetabular fossa and the medial surface of the femoral head. For both methods there were two readers, one junior and one experienced radiologist (one and seven years of practice, respectively). Interobserver reliability was calculated by intraclass correlation coefficient (ICC).

RESULTS

213 hips were non-dysplastic (ND) and 17 dysplastic (DH). In neutral position, AED in ND was 3.09 (95% CI 3.09-3.35) and in DH was 6.29 mm (95% CI 5.09-7.50). AED measured in flexion view was 3.64 (95% CI 3.60-3.79) and 7.59 (95%CI 6.09-9.09), respectively. AED measurements between both groups were significantly different (95% CI -3.623 to -2.531). ICC between measurements of the AED of the senior and the junior reviewers, both on flexion (ICC, .864, 95% CI .826-.893) and on neutral views (ICC, .852 95% CI .811-.885) was almost perfect. For Graf angles ICC was .842 (95%CI .800-.876) for alpha angle, and .760 (95%CI, .700-.810) for beta angle.

CONCLUSION

Ultrasound is worldwide-accepted for screening developmental dysplasia of the hip (DDH). It tends to reduce the rate of late diagnosis and the need for surgical interventions. AED can be used for differentiating dysplastic from non-dysplastic hips with satisfactory interobserver agreement. Graf classification is used in many countries, but it depends on a long learning curve to correctly diagnose a dysplastic hip.

CLINICAL RELEVANCE/APPLICATION

AED may be an optimal screening parameter as it is easier to perform, reproducible, and does not depend on the standard sectional view proposed by Graf, nor on sonographer's experience.

CL-PDS-WE5A • Role of Contrast Enhanced Ultrasound (CEUS) in the Identification and Evaluation of Localized Low-energy Abdominal Trauma in a Pediatric Population: Our Initial Experience

Guendalina Menichini MD ; **Margherita Trinci** MD ; **Vincenza Di Giacomo** ; **Stefania Ianniello** ; **Ilenia Di Giampietro** ;

Vittorio Miele MD (Presenter) ; Barbara Sessa MD

PURPOSE

To assess the feasibility and reproducibility of CEUS in the study of low-energy abdominal trauma compared to baseline-US and MDCT in pediatric patients. Illustrate the different CEUS patterns and focus on the typical direct and indirect signs. Discuss advantages, limits and most common pitfalls of CEUS.

METHOD AND MATERIALS

RESULTS

35/127 patients were considered eligible to be included in the study. 3/35 patients were negative at MDCT examination. In the remaining 32 patients, MDCT depicted 35 lesions (left kidney n=11; right kidney n=3; spleen n=9; pancreas n=2; liver n=5). Active bleeding was present in 4 cases, urinoma in 1. CEUS identified 30/35 lesions and no lesions in the patients with negative CE-MDCT findings. CEUS missed 3 active bleedings and the urinoma. Unenhanced US depicted 9/35 parenchymal lesions. Thus, the diagnostic performance of CEUS was much better than that of US, as sensitivity, specificity, PPV, NPV and accuracy in the evaluation of parenchymal lesions were 96.6%, 100%, 100%, 99.3% and 99.4% for CEUS and 30%, 100%, 100%, 87.3% and 88% for US.

CONCLUSION

CEUS is more sensitive and accurate than baseline-US and almost as sensitive as CT in the identification and characterization of blunt abdominal trauma. Moreover this examination can be performed at the patient's bedside, without moving the traumatized child to the CT section, representing a useful alternative to CT in the follow-up of hospitalized children with a known abdominal injury. The limits were active bleeding, urinomas and pancreatic lesions.

CLINICAL RELEVANCE/APPLICATION

According to ALARA's criteria, our data suggest that CEUS should be considered as a useful tool in the assessment and monitoring of blunt abdominal trauma in children.

CL-PDE-WE6A • Spectrum of Vascular Findings at Initial Ultrasound Post Pediatric Liver Transplant: Normal Variation and Vascular Complications

Lucy H Jamieson MD ; Bo Arys MD (Presenter) ; Gavin Low MBChB, FRCR ; Ravi Bhargava MD * ; Surekha Kumbha FRANZC ; Jacob L Jaremko MD

PURPOSE

Liver transplant Doppler ultrasound is routinely performed on post-operative day 1 to detect complications including rejection, vascular thrombosis, or biliary disruption. However, there is a lack of published data defining the normal range of ultrasound appearances in this setting. To enable evidence-based distinction between normal post-operative variation and complications, we compared Doppler ultrasound findings to clinical outcomes post liver transplant at two quaternary pediatric transplant centres.

METHODS

This ethics-approved two-centre retrospective review included children aged 0-10 years with (1) liver transplant 2002-2012 for any indication, (2) post-operative Doppler ultrasound, (3) operative reports, (4) clinical outcome data 1 year post transplant. From ultrasound performed Day 1 post transplant, we evaluated waveforms and Doppler flow parameters of common hepatic artery (CHA), intrahepatic arteries, hepatic veins (HV), main portal vein, and IVC at HV anastomosis. We recorded outcomes from clinical charts.

RESULTS

Of 111 patients, 66 (60%) had at least 1 post-operative complication, 41 (37%) requiring additional surgery. There were 30 (27%) vascular and 46 (41%) non-vascular complications. The most common vascular complications were thrombosis of common hepatic artery (CHA, 7/111) or portal vein (PV, 6/111), and hepatic venous (HV) complications (3/111). The most common non-vascular complications were biliary strictures. CHA velocity and resistive index were decreased in patients with arterial complications. Portal venous complications manifested mainly as absent portal venous flow. The normal HV flow was multiphasic and rapid, with peak velocity higher on average than in the CHA. Decreased HV velocity, although nonspecific, was associated with development of arterial and portal venous complications.

CONCLUSION

In this study we correlated Doppler ultrasound and clinical results following pediatric liver transplant in a relatively large two-centre cohort. This allowed us to construct a reference frame of ultrasound findings associated with successful outcomes or post-operative complications. An understanding of the age-specific range of expected post-transplant findings is essential to accurately detect early signs of complications, which can be crucial for graft and patient survival.

CL-PDE-WE7A • Low-dose Fetal CT in the Evaluation of Skeletal Dysplasias; Correlation with Prenatal US and MRI, and with Postnatal/Postmortem Pathology.

Teresa Victoria MD, PhD (Presenter) ; Monica Epelman MD ; Ann M Johnson MD ; Beverly G Coleman MD ; Eduardo Ruchelli ; Dale Huff ; Diego Jaramillo MD, MPH

PURPOSE/AIM

Evaluation of the fetus with presumed skeletal dysplasia (SD) is difficult because of the rarity of each disorder, the multitude of differential diagnosis for the encountered findings and the lack of precise molecular diagnosis. The sensitivity of US, the main imaging technique in obstetrics, is 40-60%. Low-dose fetal CT is a helpful imaging adjunct in evaluating a small subset of fetuses with uncertain, severe SD. The goal of this exhibit is to demonstrate our experience with fetal CT with correlation to US, MRI, molecular analysis and pathology/autopsy.

CONTENT ORGANIZATION

SUMMARY

Low-dose fetal CT is a powerful adjunct in evaluating the fetus with severe skeletal dysplasia if the diagnosis is uncertain by US. It improves the visual window to the fetal skeleton, leading to improved parental counseling and optimization of antepartum/intrapartum management.

Pediatric Radiology - Wednesday Posters and Exhibits (12:45pm - 1:15pm)

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CL-PDS-WEB • AMA PRA Category 1 Credit™:0.5

CL-PDE-WE7B • CT Dose Reduction in Pediatric Radiology: How We Decreased Dose by Half over a 7-year Span

Rodrigo I Lopez Costa MD ; Patrick D Rhoades MD ; Juan Carlos Ramirez Giraldo PhD ; Robert C McKinstry MD, PhD (Presenter) *

PURPOSE/AIM

To implement a CT radiation dose program at a major US children's hospital and track our results.

CONTENT ORGANIZATION

A. To raise awareness, we made presentations at medical staff meetings, CME conferences and community hospitals to communicate the need to lower diagnostic radiation exposure to children. B. To provide alternatives to CT, we used "Lean" methodology to streamline access to MRI. We expanded the access of US. We offered interpretation of outside hospital CTs. C. We used stepwise dose reduction to find the lowest CT technique that yielded acceptable image quality. We implemented a low dose protocol to follow patients with ventricular catheters. D. We replaced aging equipment and performed "before and after" analysis to document the impact of new scanning technologies. E. We used the radiology information system to track utilization and dose (CTDIvol and DLP). We audited our own practice in the emergency department to ensure that our use of CT for head trauma adhered to published guidelines.

SUMMARY

Through our combined efforts at the Mallinckrodt Institute of Radiology and St. Louis Children's Hospital, we were able to cut CT utilization in children roughly in half over a 7-year period. We provide acceptable CT image quality at lower dose while substantially reducing the population risk associated with excess medical radiation exposure.

CL-PDE-WE6B • Sonographic Assessment of the Joints in Pediatric Arthritis: A Pictorial Review

Gene M Weinstein MD ; Anastasia L Hryhorczuk MD (Presenter) ; Julia G Rissmiller MD ; Donald A Tracy MD

PURPOSE/AIM

The purpose of this exhibit is: (1) to highlight the utility of musculoskeletal ultrasound (US) in the evaluation of pediatric arthritis, (2) to demonstrate scanning techniques as well as the normal anatomy visualized in the sonographic assessment of pediatric joints, and (3) to illustrate the various pathologic entities that can be assessed using US in pediatric patients with arthritis.

CONTENT ORGANIZATION

A pictorial essay is presented illustrating: (1) the proper technique for musculoskeletal/joint US in the pediatric patient, (2) the normal anatomy of commonly scanned joints (elbow, wrist, hip, knee, ankle), and (3) examples of commonly seen sonographic joint findings in pediatric arthritis (effusions, synovitis, and erosions) with both radiographic and MR correlation.

SUMMARY

US is a valuable tool for the assessment of pediatric arthritis. It is especially useful as a readily available, radiation-free, and sedation-free technique for serial evaluation of joints. We aim to provide a framework for those who wish to create or expand a pediatric joint ultrasound program, as this has the potential to serve as a cost-effective technique for sequential monitoring of pediatric arthritis patients.

CL-PDE-WE5B • 3rd Ventricular Mass Lesions in the Pediatric Population: Case Based Teaching Review

Rajan P Patel MD (Presenter) ; Roy G Jacob MD ; Michael C Morriss MD

PURPOSE/AIM

Lesions in the 3rd ventricle can be broadly classified into anterior recess, posterior recess and intrinsic 3rd ventricular mass lesions. Imaging with MR is the key to their diagnosis. Management of these lesions can be surgical or nonsurgical depending on the diagnosis and presentation. Hence to have a reasonable differential diagnosis is very important. This electronic presentation outlines the following ♦
1. Review anatomy of the 3rd ventricular system.
2. Describe the imaging features of 3rd ventricular mass lesions seen in Pediatric population.

CONTENT ORGANIZATION

Material and Methods: A retrospective search of PACS was performed. Imaging studies depicting mass lesions in the third ventricle were identified. All studies were de-identified prior to image export. **Results:** Over 12 representative cases of the 3rd ventricular mass lesions including but not limited to Craniopharyngioma, Pilocytic and Pilomyxoid Astrocytoma, LCH, Hypothalamic hamartoma, Atypical teratoid rhabdoid tumor (ATRT), Ependymoma, Choroid plexus tumors, Germ cell tumors, Pineal parenchymal tumors were selected for inclusion.

SUMMARY

Familiarity with the imaging of Pediatric 3rd ventricular mass lesions helps formulating a reasonable differential diagnosis. This exhibit is meant to concisely summarize the relevant imaging features of Pediatric 3rd ventricular mass lesions.

CL-PDS-WE1B • Dynamic Evaluation of the Pediatric Airway with Low Dose Volume CT Angiography: 'One Stop Shop' Protocol for Vascular Mediated Airway Compromise

Prakash M Masand MD (Presenter) ; Siddharth P Jadhav MD ; Lamya A Atweh MD ; Rajesh Krishnamurthy MD *

PURPOSE

CT is the gold standard for non-invasive evaluation of intrinsic and extrinsic components of airway compromise. We present a new low-dose dynamic volume CT angiographic technique for airway/vessel evaluation.

METHOD AND MATERIALS

25 patients (age range 1 month-18 years) were studied using this novel protocol. All scans were performed on a 320 detector CT scanner providing 16 cm coverage with a single rotation. 6-8 volumetric data sets were acquired at 80 kV and 20-60 mA based on age, gantry rotation time of 0.35-0.5 secs, with integrated adaptive iterative reconstruction, yielding an average total dose of < 1.5 mSv. 18 studies were performed in intermittent mode with acquisition every 1.4 seconds, and 7 using continuous (cine) mode, depending on respiratory and heart rate, to achieve target sampling rate of less than half the respiratory cycle duration. Simultaneous IV contrast injection provided first-pass angiographic assessment of the vessels. Studies were read by one reader and assessed for adequacy of sampling inspiration and expiration, demonstration of airway/vascular pathology, and feasibility of 3D reconstruction and virtual bronchoscopy. Correlation of imaging data with endoscopic and surgical findings is pending.

RESULTS

All studies were technically successful in sampling inspiratory and expiratory phases of the respiratory cycle, for adequate opacification of the vasculature of the chest, and 3D reconstruction of the airway and vasculature. Fixed versus dynamic obstruction related to tracheobronchomalacia was assessed in all cases. Dynamic airway compromise was considered to be present when there was 50% reduction in cross sectional diameter in expiration. Underlying pathology of airway compromise demonstrated included vascular rings, cartilaginous rings with pulmonary sling, tracheal stenosis from prior tracheostomy, extrinsic compression from dilated pulmonary arteries, innominate artery compression and aortic root dilatation.

CONCLUSION

This low dose dynamic airway/vessel volumetric imaging protocol provides assessment of all relevant pathologic targets for intrinsic and extrinsic vascular mediated airway compromise, allowing decision making regarding management and obviating the need for more invasive diagnostic procedures.

CLINICAL RELEVANCE/APPLICATION

This protocol has the potential to provide a comprehensive assessment of the dynamic and mechanical issues relating to the pediatric airway .

CL-PDS-WE2B • Comparison of Dose Reduction and Image Quality in Pediatric Chest CT with Different Adaptive Statistical Iterative Reconstruction Blending

Ji Hang Sun (Presenter) ; Yun Peng MD

PURPOSE

The purpose of this study was to compare radiation dose, noise and image quality of low-dose chest CT images reconstructed using an adaptive statistical iterative reconstruction (ASIR) with 70%ASIR and 30%ASIR blending.

METHOD AND MATERIALS

Forty-two children (study group with age 2m~11y, mean age 4.5years) underwent low-dose chest CT with 70%ASIR. Age-dependent noise index (NI) was used: NI=12 for 0~1 year old, NI=15 for 1~3 years old, NI=17 for 3~7 years old, and NI=20 for 7~18 years old. Another group of 80 children (control group, age 29d~16y, and mean age 3.3years) underwent low-dose chest CT with 30%ASIR. NI for the control group was set to NI=11 for 0~1 year old, NI=13 for 1~3 years old, and NI=15 for 3~18 years old. Two radiologists independently evaluated images for normal lung structures, abnormal CT findings, and image noise on a 5-point scale with 3 being clinically acceptable. Quantitative measures of radiation dose and image noise on left ventricle and muscle were also obtained and statistically compared between the two groups. The inter-observer agreement was tested with kappa statistics.

RESULTS

The image noise for the study group was 13.10 ± 4.90 , slightly higher than 11.17 ± 4.30 for the control group. However, the mean image quality scores for the study group and control group were 3.54 ± 0.24 and 3.66 ± 0.20 , respectively, with no significant difference ($p > 0.05$). All images were judged to be acceptable for clinical diagnosis, and there was good inter-observer agreement in diagnostic acceptability ($k=0.50$). On the other hand, the average CT DIvol for the study and control groups were 0.72 ± 0.18 mGy and 1.19 ± 0.78 mGy, respectively. The 70%ASIR provided 40% lower dose than the 30%ASIR reconstruction with significant difference (p

CONCLUSION

Compared with 30%ASIR, low-dose CT with 70%ASIR provides additional 40% dose reduction in pediatric chest CT examinations, while maintaining diagnostically acceptable images.

CLINICAL RELEVANCE/APPLICATION

The use of an adaptive statistical iterative reconstruction algorithm with 70% blending can further reduce radiation dose to pediatric patients undergoing chest CT with clinically acceptable images.

CL-PDS-WE3B • Evaluation of Image Quality and Radiation Dose in Paediatric Thoracic 256 Multidetector Computed Tomography (MDCT) without Sedation

Michaela I Cellina (Presenter); **Beatrice Tagliaferri** MD; **Alberto Torresin** MPH; **Giuseppe Sturniolo**; **Luca Trombetta**; **Michele Maddalo**; **Beatrice Tagliaferri**

PURPOSE

To assess image quality and radiation dose of high resolution chest CT examination without sedation in children and toddlers on a 256 MDCT, considering that estimated dose from MDCT in children is an open problem. Methods for estimating radiation dose from CT examinations are not patient oriented but based on reference phantom.

METHOD AND MATERIALS

36 children and toddlers aged 1.5-14 years (7.9 ± 3.8 yy), 15 weighting > 35 kg (range: 35-63; mean 41.8 ± 10.5 kg) and 21 weighting = 35 kg (range: 15-35; mean 26.3 ± 5.8 kg) underwent thoracic CT on 256-slice CT scanner (Somatom Definition Flash, Siemens) without sedation. Main indications for high-resolution CT were: congenital airways or lung malformations, recurrent pneumonia, severe asthma unresponsive to therapy, suspected bronchiectasis, unexplained chronic cough. Acquisition parameters were as follows: tube voltage: 100 kV; reference current: 130 mAs with attenuation-based tube current modulation (CARE Dose 4D); pitch: 3; rotation time: 0.28 s; collimation: 3×0.6 mm; image reconstruction thickness: 3 mm; position increment: 3 mm. Inspiratory and expiratory datasets were acquired for all exams. Image quality, artifacts and diagnostic confidence were evaluated by 2 experienced radiologists in consensus using a 5-point grading scale (1=unacceptable; 5= perfect). Image noise was calculated by placing a region of interest of 1 cm² in the ascending aorta measuring the average of the standard deviations in HU. CTDI vol and DLP were recorded; effective dose was calculated for each patient using accepted age-dependent-conversion factors (Bongartz et al., 2004).

RESULTS

All exams were successfully acquired. Images of diagnostic quality (= 4) were obtained in all patients. Mean image quality was 4.4 ± 0.4 ; mean artifacts: 4.4 ± 0.5 . Image noise was: 10.6 ± 8.2 for patients = 35 kg and 9 ± 4.2 for patients > 35 Kg. DLP were: 42.6 ± 10.3 (= 35 kg) and 92.96 ± 28.6 (> 35 kg) mGycm; CTDI were: 1.62 ± 0.3 mGy (= 35 kg) and 3.0 ± 0.8 mGy (> 35 kg). Effective doses were: 1.33 ± 0.35 mSv for patients = 35 kg and 2.5 ± 0.9 for those > 35 kg.

CONCLUSION

As long as the CT examination is justified, it is possible to obtain optimum image quality without the need of sedation and with acceptable radiation exposure.

CLINICAL RELEVANCE/APPLICATION

In pediatric patients with suspected severe or malformative airways pathology with non diagnostic X rays, new generation CT are a good compromise between diagnostic information and radiation exposure

CL-PDS-WE4B • Role of Free-breathing MDCT Study in Pediatric Patients with Upper Respiratory Tract Obstruction and Sleep Apnea Syndrome: Direct Comparison with Sleep Endoscopy Procedure

Alessandro Masetto MD (Presenter); **Francesca Rossi**; **Davide Ippolito** MD; **Pietro A Bonaffini** MD; **Cammillo R Talei Franzesi**; **Sandro Sironi** MD

PURPOSE

To evaluate the accuracy of multidetector CT examination for the evaluation of the upper airways tract (UAT) in pediatric patients with obstructive syndromes and sleep apnea syndrome in comparison with sleep endoscopy (SE), considered as gold standard.

METHOD AND MATERIALS

Thirty-six pediatric patients affected by a variety of diseases determining obstructive syndromes, particularly during sleep, were submitted to a free-breathing low-dose CT study of the UAT; among them, 8 patients (4 males, mean age 4.2 years old), (3 mucopolysaccharidosis IV, 1 mucopolysaccharidosis VI, 1 Down syndrome, 1 bronchodysplasia, 1 complex syndromic pathology, 1 obstructive sleep apnea syndrome) underwent a SE. Both procedures were performed under sedation. A radiologist performed multiplanar and virtual endoscopy reconstructions, evaluated the quality of the CT scan (score: A=good/very good, B=fair, C=poor) dividing the UAT in nasal fossa, rhinopharynx, oro- and hypopharynx, trachea (further divided in proximal, medium and distal third) and carina; stenoses were pointed out and a semi-quantitative score was given (mild, moderate, severe, obliteration). An otorhinolaryngologist reviewed the SE videos, evaluating the same parameters with the same score. Last, radiologist and otorhinolaryngologist compared the results side by side to clarify discrepancies.

RESULTS

CT image quality was overall good (A=6, B=1, C=1); concordance between CT and SE was high in 8/8 patients for the evaluation of nasal fossa, rhinopharynx, trachea and carina. For the evaluation of oro- and hypopharynx concordance was high in 3/8 patients, medium in 2/8, low in 3/8. CT could evidentiate the location of stenosis in 6/8 patients.

CONCLUSION

Free-breathing low-dose CT provides globally an accurate representation of the UAT, but it is not reliable for the evaluation of structures characterized by excessive movement during breathing; a dynamic endoscopic assessment offers much more information, and it is not replaceable by CT.

CLINICAL RELEVANCE/APPLICATION

ASRT@RSNA 2013: Pediatric CT/CTA: Techniques and Applications

Wednesday, 02:20 PM - 03:20 PM • N230

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MSRT42 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1
Marilyn J Siegel, MD*

LEARNING OBJECTIVES

1) Describe the optimal techniques in performing CT/CTA in children. 2) Identify the applications of CT/CTA in children. 3) State the CT/CTA findings of common diseases in children.

ABSTRACT

PURPOSE To review the technique modifications that can optimize the CT images and the common applications in pediatric computed tomography (CT) and CT angiography.

CONTENT ORGANIZATION

1. Basic Imaging techniques and protocols in pediatric populations (chest and abdomen CT and CT angiography). 2. Effective use of oral and intravenous contrast medium. 3. Indications for multiplanar and 3D reformations. 4. Clinical applications of CT and CTA. **SUMMARY** CT data acquisition using current technology CT systems enables fast volume coverage with less motion artifacts, less sedation and radiation dose reduction. This presentation will review the basic steps and best imaging protocols for performing CT and CTA in children. The indications for post-processing multiplanar and volume rendered reconstructions will be reviewed. The common indications for performing CT and CTA along with examples of clinical cases will be presented. At the conclusion of this presentation, the technologists should have a basic understanding of how to perform CT and CTA in a pediatric population.

Pediatrics (Chest)

Wednesday, 03:00 PM - 04:00 PM • S102AB

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SSM18 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

R. Paul Guillerman, MD

Moderator

Robert H Cleveland, MD*

SSM18-01 • Structural Abnormalities of the Lung in Children Born Extremely Preterm during the Surfactant Era

Karla M Logie BSc (Presenter); Conor Murray; Graham L Hall PhD; J. J Pillow MD; Andrew C Wilson MD

PURPOSE

The long-term structural consequences of preterm birth upon the lungs remain unclear due to improved clinical management, survival rates and survival from younger gestations. Secondary to preterm birth, many infants develop bronchopulmonary dysplasia (BPD) the lung disease attributed to impaired morbidity and lung function. The purpose of this study was to assess lung structure in a contemporary cohort of children born at = 32 weeks gestation. We hypothesised that structural abnormalities would be present in preterm children regardless of BPD status, with increased frequency and severity in the BPD cohort.

METHOD AND MATERIALS

Images of 1mm thickness were obtained from a 64-slice CT machine (Philips Brilliance 64; Philips Medical Systems, Eindhoven, Netherlands). Inspiratory images were obtained at 10mm intervals from the lung apex to the diaphragm. Three expiratory images were collected at the level of the carina and the mid-points between the carina and the lung apex, and the carina and the diaphragm, respectively. Consensus scoring using a previously published, preterm specific protocol was performed by a paediatric thoracic radiologist and paediatric respiratory physician.

RESULTS

Structural lung abnormalities were present in 94 of the 100 preterm children. The most common abnormalities were the presence of linear/triangular sub pleural opacities (n = 86), peribronchial thickening (n = 43) and pulmonary hypoattenuation on expiration (n = 43). Only hypoattenuation on inspiration and sub-segmental collapse/consolidation were more common in the BPD vs. Non-BPD cohort (45% vs. 19% and 18% vs. 0%, p = 0.01; respectively). The total chest CT score per child (sum of structural abnormalities a marker of extent of structural damage) ranged from 0 to 26 and was significantly higher in the BPD group (median total score of 8 vs. 4; p=0.01). Total score was associated with oxygen (p = 0.02) and mechanical ventilation durations (p = 0.02).

CONCLUSION

This study has shown that pulmonary structural abnormalities are present in 94% of children born preterm, regardless of neonatal diagnosis of BPD. The extent of structural damage, indicated by total chest CT score, was associated with extent of neonatal respiratory support.

CLINICAL RELEVANCE/APPLICATION

Structural abnormalities within the lungs of preterm infants remain evident at 9 to 11 years of age. Severity of lung damage is associated with, but not exclusive to, neonatal lung disease.

SSM18-02 • Markov Model Optimization of the Imaging Screening Strategy for Cystic Pleuropulmonary Blastoma in Children with DICER1 Mutations

Divya Sabapathy (Presenter); R. Paul Guillerman MD; Jack Priest MD; Robert Orth MD, PhD*; Eugene Kim MD; William Foulkes MD; Ananth Annapragada PhD*

PURPOSE

Pleuropulmonary Blastoma (PPB), the most common primary pediatric pulmonary neoplasm, is strongly associated with DICER1 gene mutations. Unresected type I (cystic) PPB may progress into more aggressive type II/III during early childhood. X-ray based screening for the disease bears the risk of radiation induced malignancies. We therefore compared the utility of chest radiography (CXR) and computed tomography (CT) screening strategies for cystic PPB in children with DICER1 mutations.

METHOD AND MATERIALS

A Markov model was used to project the outcomes of 100,000 hypothetical patients undergoing screening for PPB. Estimates of PPB risk given a DICER1 mutation, risk of progression from type I to type II/III PPB, and PPB subtype mortality were estimated from the International PPB Registry data. Scenarios included patients aged 0-3 years with annual, biannual and quarterly CXR or CT exams. Additional scenarios with only 1 or 2 CT exams during the entire 3 year period were also tested. Radiation doses were based on dosimetry estimates. Lifetime radiation-attributable risks of cancer incidence and mortality were derived from the BEIR VII report. Mortality and life expectancy loss were calculated using a life table method to evaluate lifetime detriment.

RESULTS

Patients screened with CT incur higher lifetime detriment due to radiation-induced cancer than those screened with CXR. However, CT identified virtually all cystic PPB at the first screen while CXR required multiple screening cycles. The model predicts that even for multiple (>2) CT examinations, the average loss of life expectancy is on the order of days. This is orders of magnitude lower than for undetected PPB, which results in an average loss in life expectancy of >10 years. Sensitivity analysis showed that model uncertainty was dominated by the exam radiation dose.

CONCLUSION

The model suggests that the benefits of chest CT for cystic PPB detection greatly exceed the potential risks attributable to radiation exposure.

CLINICAL RELEVANCE/APPLICATION

Markov modeling can be used to compare projected radiation-induced cancer and disease-related risks and guide optimization of imaging-based disease surveillance strategies.

SSM18-03 • Radiological Evaluation of Neonatal Ventilator - Associated Pneumonia

Roberto Llorens Salvador (Presenter) ; **Maria Cernada Badia MD** ; **Amparo Moreno Flores MD** ; **Marta Aguar MD**

PURPOSE

1. To illustrate the radiological patterns depicted in chest radiographies in those intubated neonates diagnosed of ventilator-associated pneumonia (VAP).
2. To discuss the impact of chest imaging in neonatal VAP diagnosis.

METHOD AND MATERIALS

Following the CDC/National Nosocomial Infection Surveillance criteria, persistent radiological infiltrates or consolidation in two sequential radiographs after initiation of mechanical ventilation, in the proper clinical and microbiological scenario, are necessary to diagnose VAP. After a prospective observational cohort study conducted in our tertiary-care regional referral center for a 2-yr period, two experienced pediatric radiologists, blinded to the clinical suspicion in the moment of imaging interpretation, reviewed the radiological patterns detected in the X-rays of 202 neonates included in the study. Both radiologists, separately, evaluated retrospectively the chest radiographs and registered in a electronic data sheet (Excel 2010, Microsoft) the radiological findings according to their individual interpretation following the criteria mentioned before. Detailed causative microbiological agents were investigated using invasive bronchoalveolar lavage (BAL).

RESULTS

Out of 398 newborn infants a total of 202 neonates were on mechanical ventilation (MV) more than 48h, of whom 16 were diagnosed of VAP (prevalence 8.1 %). The mean age at diagnosis was 29±15 days and a mean of 21±16 days on MV had elapsed at onset of VAP. Clinical suspicion of VAP required a radiological confirmation and the most frequent radiological features associated with VAP were persistent atelectasis or consolidation on chest radiograph (88.9% of episodes). Radiological infiltrate was described in 55.6 % of cases. Both radiologists considered equally the radiographies as to be suggestive of VAP in the 100% of cases finally diagnosed as VAP. The most frequently isolated microorganism (19%) was *P aeruginosa*, being the Gram negative organisms responsible for 61.9 % of VAP.

CONCLUSION

There are typical radiological patterns that radiologists should be able to recognise in chest radiographies of intubated neonates in the NICU. Under clinical suspicion, radiological information is a key feature to let neonatologists perform invasive techniques as BAL to confirm VAP diagnosis.

CLINICAL RELEVANCE/APPLICATION

Recognition of determined radiological patterns is important to lead invasive diagnosis of VAP in intubated neonates in the NICU.

SSM18-04 • Imaging for Assessing Progression in Cystic Fibrosis Lung Disease: What Is the Best Approach?

Robert H Cleveland MD (Presenter) * ; **Catherine Stamoulis PhD** ; **Gregory Sawicki MD** ; **Emma L Kelliher MBBCh, MRCPI** ; **Evan J Zucker MD** ; **Christopher Wood BA** ; **David Zurakowski PhD** ; **Edward Y Lee MD, MPH**

PURPOSE

To determine the best imaging tool in assessing longitudinal progression of Cystic Fibrosis (CF) lung disease.

METHOD AND MATERIALS

Four radiologists independently scored 211 serial chest x-rays (CXR) from 30 CF patients twice using the Brasfield and twice using the Wisconsin systems. Scores were compared to the patient's simultaneously acquired PFTs (FEV-1 and FVC). Intra- and inter-rater Pearson correlation coefficients were estimated for each system to assess respective consistency and reproducibility. Brasfield and Wisconsin scores were averaged and then converted to z-scores and compared to each other and to z-scores of the FEV-1 and FVC to determine correlation to each other and to clinical gold standards. In addition to mean scores for each reader, the coefficient of covariation were calculated to determine variability within each system's raw scores. As recently reported from the Wisconsin group, CT has not shown superiority over serial CXR for longitudinal assessment of CF lung disease. Therefore, since CT results in increased radiation dose, cost and supplemental imaging, CT was not evaluated.

RESULTS

For the 4 readers, intra-rater correlation was in the range $r=0.91-0.99$ for Brasfield and $r=0.83-0.99$ for Wisconsin (all p

CONCLUSION

When comparing reader reliability, the Brasfield and Wisconsin systems perform almost identically. Compared to each other and to PFTs, both systems perform almost identically. More variability in scoring occurred with the Wisconsin system.

CLINICAL RELEVANCE/APPLICATION

Imaging has become recognized as a reliable outcome assessment tool in CF research. This study reveals that Brasfield and Wisconsin assessment are equally reliable as such tools.

SSM18-05 • Low-dose CT Protocol with Post-processing Techniques in Children for Clinically Suspected Tracheobronchial Foreign Bodies

Nong Qian (Presenter) ; **Changjie Pan**

PURPOSE

The purpose of our study was to assess the sensitivity and specificity of low-dose computed tomography (CT) in children for suspected tracheobronchial foreign bodies (FBs) by using rigid bronchoscopy (RB) as the reference standard.

METHOD AND MATERIALS

A prospective study of 79 children who were admitted with suspected tracheobronchial FBs underwent non-contrast lung CT were included in the study. All studies were performed on a Dual-source CT (DSCT) with high pitch scan model (low-dose protocol). All patients performed Post-processing (PP) techniques including multiplanar reconstruction (MPR), minimum intensity projection (Min IP), and virtual bronchoscopy (VB) were performed. Two radiologists independently evaluated the characterization of the tracheobronchial FBs (location, shape and pulmonary complications). All patients underwent rigid bronchoscopy (RB) evaluation within 24 hours after foreign bodies were confirmed or highly suspected in CT. Statistical analysis was performed with 2×2 contingency tables; 95% confidence intervals (CIs) were calculated with the Blyth-Still-Casella procedure.

RESULTS

Mean patient age was 1.9 years (range, 2 months to 6 years; 58% male patients). Tracheobronchial FBs were depicted at RB in 72 of 79 patients. In 70 of 72 patients, DSCT with PP depicted a tracheobronchial FBs. Two patients with normal findings at DSCT with PP had tracheobronchial FBs at RB. Sensitivity and specificity of CT with PP were 97.2% (95% CIs: 93.4%, 100%) and 85.7% (95% CIs: 42.0%, 100%), respectively. Positive and negative predictive values were 98.6% (95% CIs: 95.8%, 100%) and 75.0% (95% CIs: 35.0%, 97.0%), respectively. Overall accuracy was 96.2% (95% CIs: 92.0%, 100%). Mean effective dose was 0.57 mSv (range, 0.17-0.77 mSv).

CONCLUSION

DSCT with a low-dose protocol with post-processing techniques had high sensitivity and positive predictive values for depiction of FBs in children. It can accurately exhibit the indirect signs and pulmonary complications.

CLINICAL RELEVANCE/APPLICATION

low-dose DSCT with PP can noninvasively depict pediatric tracheobronchial FBs. Sensitivity, and PPV are high, particularly in patients of the FBs are nonradiopaque, mean effective dose of all examina

SSM18-06 • Comparison of Low Dose Chest CT with CR Chest Images in the Management of Pediatric Pulmonary Tuberculosis Infection

Elizabete Kadakovska (Presenter) ; **Gabriel Bartal** MD ; **Ausma Ozolina** MD ; **Evija Livcane** MD, PhD ; **Iveta Ozere** MD, PhD ; **Elina Valtere** MD

PURPOSE

Currently diagnosis of Pulmonary Tuberculosis (Tb) is based on medical history, physical examination, specific tests for Tb infection and chest computerized radiography (CR). Vast number of infected children remains undiagnosed, thus creating a reservoir for future adult disease. Diagnosis of Lung Tb in children is complex can be easily missed and chest CR does not exclude all cases of active Tb. Our purpose was to compare low dose Chest CT and chest CR in children following a course of medical treatment.

METHOD AND MATERIALS

Between January 2008 and December 2012, 61/295 children in the State Tuberculosis hospital of Latvia with clinical and laboratory signs of Tb underwent low dose Chest CT (80 kV, 90 mAs, CT DIvol (mGy) 0.68, DLP (mGy-cm) 23.12) and CR following a course of specific Anti Tuberculosis treatment. The inclusion criteria for the study were laboratory and clinical improvement. Two certified chest radiologists (EK and AO) retrospectively, independently and blindly compared chest CR and CT findings.

RESULTS

61/295 (21 %) had significantly improved bacteriology and clinical picture following the initial treatment. Comparison of radiological findings between CR and CT was performed in the following parameters Chest CR vs. CT findings were as following: air space consolidation 24 (39%) / 29 (47%), nodular lesions 16(26%) / 22(36%), lymphadenopathy 9(15%) / 25(41%), pleural effusion 9(15%) / 9(15%), cavitations with parenchymal lesions 7(11%) / 11(18%), Ghon complex 4(6%) / 13(21%), calcified lymph nodes 2(3%) / 17(28%) respectively. Cavitations with parenchymal lesions were observed in 11/61(18%) on CT only. It was possible to avoid unnecessary treatment based on CT findings.

CONCLUSION

Low dose CT can improve management of pulmonary Tb thus avoiding unnecessary and possibly harmful antibiotic treatment in pediatric population.

CLINICAL RELEVANCE/APPLICATION

Low dose chest CT is valuable tool in diagnosis and management of Tb in children

Case-based Review of Neuroradiology: Brain (An Interactive Session)

Thursday, 08:30 AM - 10:00 AM • S100AB

PD NR

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MSCN51 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Pina C Sanelli, MD

LEARNING OBJECTIVES

1) Provide a review of imaging findings in adult brain pathologies highlighting key diagnostic features. 2) Review pertinent differential diagnostic considerations. 3) Provide important diagnostic imaging pearls and pitfalls.

MSCN51A • Adult Brain

Pina C Sanelli MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

MSCN51B • Pediatric Brain

Tina Y Poussaint MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

MSCN51C • Common Misdiagnoses

Pamela W Schaefer MD (Presenter)

LEARNING OBJECTIVES

View learning objectives under main course title.

Case-based Review of Pediatric Radiology: Pediatric Thoracic Imaging (An Interactive Session)

Thursday, 08:30 AM - 10:00 AM • S406A

PD CH

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MSCP51 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Edward Y Lee, MD, MPH

MSCP51A • Congenital and Acquired Thoracic Vascular Disorders in Children

Lorna Browne MD, FRCR (Presenter)

LEARNING OBJECTIVES

1) Discuss 'segmental' approach to aid diagnosis of congenital cardiovascular anomalies. 2) Review imaging techniques. 3) Review clinical aspects and characteristic imaging findings of commonly encountered congenital and acquired cardiovascular diseases in children. 4) Review the common congenital heart disease surgical repairs and their most frequent complications.

MSCP51B • Thoracic Infections in Infants and Pediatric Patients

Ricardo Restrepo MD (Presenter)

LEARNING OBJECTIVES

1) Discuss the different imaging approach of tuberculosis in pediatric patients at different ages and the differential diagnosis. 2) Discuss parenchymal lung infections that present as cavitating lesions in children and their differential diagnosis. 3) Show several examples of unusual thoracic fungal infections in children. 4) Discuss differential diagnosis of chest wall infections in children and imaging approach. 5) Discuss round pneumonia, imaging findings, work up and differential diagnosis.

MSCP51C • Diffuse Lung Disease in Pediatric Population

Edward Y Lee MD, MPH (Presenter)

LEARNING OBJECTIVES

1) Discuss a new classification system of diffuse lung disease in pediatric population. 2) Review helpful clinical aspects and imaging findings of diffuse lung disease in children. 3) Learn characteristic HRCT imaging findings to narrow the differential diagnoses of diffuse lung disease in pediatric patients.

Vascular Lesions in Children: Diagnostic Dilemmas and Treatment Options

Thursday, 08:30 AM - 10:00 AM • S102AB



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RC613 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC613A • Hemangiomas and Vascular Syndromes

Patricia E Burrows MD (Presenter) *

LEARNING OBJECTIVES

1) Participants will become familiar with the current classification of vascular anomalies, including subtypes of hemangioma and vascular overgrowth syndromes. 2) They will be familiar with imaging findings associated with different subtypes of hemangiomas, simple vascular malformations and vascular overgrowth syndromes. 3) They will be able to prescribe appropriate imaging studies, based on the clinical findings.

ABSTRACT

This presentation will review a classification of vascular anomalies and associated imaging findings. Hemangiomas are proliferative tumors of infancy. Infantile hemangioma (glut1 positive) is the most common and consists of a soft tissue mass composed of capillaries with dilated feeding and draining vessels. Congenital hemangiomas (glut1 negative) (RICH and NICH) are fully formed at birth and behave differently from infantile hemangiomas. Imaging may also be different. Vascular malformations are usually composed of channels without a soft tissue mass. Combined malformations are the exception, as they are often associated with soft tissue overgrowth. Venous malformations are classified as focal, multifocal or diffuse types. Familial forms include blue rubber bleb nevus syndrome, glomuvenous malformation and cutaneomucosal venous malformations. Sporadic and cutaneomucosal venous malformations are caused by TIE2 mutations. Venous malformations are hyperintense on T2 weighted images and usually show slow and partial enhancement. Lymphatic malformations can be cystic [macrocytic, microcytic] or composed of dysfunctional channels. These generally appear hyperintense on T2 weighted imaging and to not enhance. AVM and AV fistula appear as dilated channels, usually within normal or hypertrophied tissue. Angiography shows early venous drainage. Angioarchitecture varies. Associated mutations include ALK1, endoglin, SMAD4, RASA-1, PTEN. Combined malformations can be associated with low flow or fast flow channels and often have associated soft tissue overgrowth. Syndromic forms include Klippel-Trenaunay syndrome (CLVM), CLOVES syndrome, CM macrocephaly syndrome, and PTEN hamartoma syndrome. These patients require careful and extensive imaging to identify the vascular anomalies present, limb length discrepancy and soft tissue anomalies. In summary, vascular anomalies vary in their extent and severity of symptoms. Ultrasonography is useful to determine flow characterist

RC613B • Treatment of High-Flow Lesions - Manage or Cure?

David M Hovsepian MD (Presenter) *

LEARNING OBJECTIVES

1) Participants will learn about treatment planning for arteriovenous malformation, about challenging cases that require multiple approaches in staged procedures, and possible complications from IR intervention.

ABSTRACT

RC613C • Low-flow Lesions-Basic and Advanced Treatment Options

Leah E Braswell MD (Presenter)

LEARNING OBJECTIVES

Participants will learn about needle sclerotherapy techniques for venous malformation and drain sclerotherapy techniques for macrocystic lymphatic malformation. Complimentary treatment techniques, peri-procedural management, and long term follow-up will be discussed.

Case-based Review of Neuroradiology: Spine (An Interactive Session)

Thursday, 10:30 AM - 12:00 PM • S100AB



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MSCN52 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Pina C Sanelli, MD

MSCN52A • Adult Spine

Suresh K Mukherji MD (Presenter)

LEARNING OBJECTIVES

1) Review the common infectious processes of the adult spine. 2) Review the common inflammatory processes of the adult spine. 3) Review the common neoplastic processes of the adult spine.

ABSTRACT

1. Review the common infectious processes of the adult spine
2. Review the common inflammatory processes of the adult spine
3. Review the common neoplastic processes of the adult spine

MSCN52B • Pediatric Spine

Erin S Schwartz MD (Presenter)

LEARNING OBJECTIVES

1) Identify the key imaging features of various common pediatric spine diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

MSCN52C • Common Misdiagnoses

Gordon K Sze MD (Presenter)

LEARNING OBJECTIVES

1) To recognize common patterns for spine and spinal cord pathology and to organize these patterns into categories of diseases processes. 2) To be aware of subtle findings that can lead one to favor one category of disease over another. 3) To be able to differentiate MR artifacts from true pathology in the spine and spinal cord.

Case-based Review of Pediatric Radiology: Pediatric MSK Imaging (An Interactive Session)

Thursday, 10:30 AM - 12:00 PM • S406A

PD MK

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MSCP52 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Edward Y Lee, MD, MPH

MSCP52A • Sport-related Injuries in Pediatric Population

Kirsten Ecklund MD (Presenter)

LEARNING OBJECTIVES

1) Attendees will learn to recognize common sports related injuries to the pediatric musculoskeleton. 2) Physeal injury will be emphasized. Attendees will learn to distinguish normal physiologic physeal appearance from pathology. 3) Practical aspects of pediatric musculoskeletal imaging will be discussed. Attendees will learn tips for efficient, high quality MR protocols for MSK trauma.

MSCP52B • Pediatric Musculoskeletal Benign and Malignant Neoplasms

Andrea S Doria MD (Presenter) *

LEARNING OBJECTIVES

1) Review the classification system of musculoskeletal pediatric masses (by tissue type). 2) Describe clinical aspects, imaging characteristics and differential diagnosis of pediatric benign and malignant masses according to histologic tissue. 3) Discuss imaging-pathologic correlation of pediatric masses according to histologic tissue.

ABSTRACT

A wide range of musculoskeletal tumors occurs in the pediatric population. Radiologists should be aware of the clinical and conventional imaging manifestations of these tumors in order to provide timely specialist referrals so that early diagnosis and treatment can be achieved. Improvements in clinical-imaging diagnosis and treatment have increased the survival of many children with malignant musculoskeletal tumors in the last decade. Recognizing specific imaging characteristics of benign and malignant masses is paramount for prompt narrowing of differential diagnoses. Imaging-pathologic correlation of neoplasms according to histologic type facilitates the understanding of the complexity, diversity and in vivo behaviour of several musculoskeletal tumors.

MSCP52C • Skeletal Dysplasia in Pediatric Patients

Teresa Victoria MD, PhD (Presenter)

LEARNING OBJECTIVES

1) To discuss available tools in the imaging armamentarium in order to evaluate the fetus with a presumed diagnosis of skeletal dysplasia. 2) To discuss a systematic approach to evaluate postnatal imaging findings of skeletal dysplasias. 3) To assess and interpret postnatal imaging findings with the goal of constructing a differential diagnosis.

Pediatrics (Neuroradiology)

Thursday, 10:30 AM - 12:00 PM • S102AB

PD MR NR

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SSQ17 • AMA :1.5 • ARRT:1.5

Moderator

Tina Y Poussaint, MD

SSQ17-01 • Assessment of White Matter Integrity Using Tract-based Spatial Statistics in Lennox-Gastaut Syndrome

Mina Park MD ; Injoong Kim (Presenter) ; Kwon Joon Ho MD ; Yoon Seong Choi MD ; Na-Young Shin MD ; Kyung-Eun Kim MD ; Jinna Kim MD ; Seung-Koo Lee MD, PhD

PURPOSE

Lennox-Gastaut syndrome is a severe form of epilepsy with childhood onset, accompanying with moderate to severe cognitive dysfunction. However white matter disruption of the patients remains unclear. The aim of this study was to evaluate white matter integrity by using DTI in patients with Lennox-Gastaut syndrome without morphologic abnormalities in conventional imaging.

METHOD AND MATERIALS

In a retrospective study, diffusion tensor images from 11 patients of Lennox-Gastaut syndrome without morphologic abnormalities on conventional MRI were processed. Eleven clinical control subjects were matched for age, sex, and scanning parameters. Paired TBSS was performed to evaluate differences in FA .

RESULTS

In patients with Lennox-Gastaut syndrome, FA value clusters in the white matter was significantly decreased compared to the healthy controls. Significant FA values reduction in patients with Lennox-Gastaut syndrome were found in the right middle frontal gyrus, left superior frontal gyrus, bilateral anterior thalamic radiations, corpus callosum, external and internal capsules, inferior fronto-occipital fasciculus, and corticospinal tracts.

CONCLUSION

Despite qualitatively normal-appearing white matter tissues, patients with Lennox-Gastaut syndrome have widespread microstructural changes measurable with quantitative DTI. Although the pathologic-anatomic correlation of these findings remains, these regions are strongly suggested to be related to cognitive impairments in these patients.

CLINICAL RELEVANCE/APPLICATION

Fractional anisotropy evaluated using tract-based spatial statistics can be used to show abnormalities in the patients with Lennox-Gastaut syndrome who have normal findings at conventional MR imaging.

SSQ17-02 • Functional Connectivity in Children with Sickle Cell Anemia and Normal Brain MRI

Kathleen J Helton MD (Presenter) ; Diana Fridlyand BS ; Matthew Scoggins PhD ; Ping Zou PhD ; Jane Hankins MD ; Banu Aygun MD ; Jane Schreiber PhD ; Robert J Ogg PhD

PURPOSE

Children with sickle cell anemia (SCA) are at risk for cognitive impairment, but the etiology of cognitive dysfunction in patients without visible evidence of brain injury remains unknown. We have shown that intelligence quotient in children with SCA is associated with altered blood-oxygenation level dependent (BOLD) functional MRI response to visual stimulation, findings that suggest chronic anemia alters the neural-hemodynamic coupling that supports healthy brain function. We used BOLD fMRI to test the hypothesis that cognitive dysfunction in SCA is associated with altered brain network connectivity.

METHOD AND MATERIALS

Following IRB-approval and written informed consent, 15 untreated children (12.37±3.39 years) with SCA underwent fMRI (resting-state and Nback) and neuropsychological testing (IQ, Wechsler Intelligence Scale for Children, 2003). After realignment, slice time correction, spatial normalization and smoothing (SPM8, <http://www.fil.ion.ucl.ac.uk/spm/>), spatially independent brain regions with correlated temporal patterns of activity (components) were identified with independent component analysis (ICA) of resting and task data (GIFT link?). Adjacency matrices were constructed based on pair-wise correlation of component time courses. Networks metrics (modularity, cost-integrated average degree, cost-integrated average local efficiency, cost-integrated global efficiency) were analyzed in relation to published healthy normal (N) values, age, and IQ.

RESULTS

Global efficiency (SCA=0.4, N=0.6) and modularity (SCA= 0.16, N=0.4-0.6) were lower than normal, and global efficiency was negatively correlated with modularity (p

CONCLUSION

Decline of IQ with age shows adverse effects of disease on cognitive function. Network analysis revealed altered organization of brain networks in children with SCA, and graph-theoretical network metrics reflected abnormal age-related decline in IQ. The connectivity patterns we observed may help to elucidate the mechanism of cognitive dysfunction in SCA

CLINICAL RELEVANCE/APPLICATION

Functional connectivity analysis holds great promise as a clinical adjunct in future studies of patients with SCA to assess effectiveness of treatment in improving neurocognitive function.

SSQ17-03 • 3T Apparent Kurtosis Coefficient (AKC) in Pediatric Brain: Preliminary Results

Marzia Mortilla MD (Presenter) ; Antonio Ciccarone MD, PhD ; Marco Esposito ; Claudio Fonda MD

PURPOSE

Our purpose was to identify a MRI method for quantifying the degree to which water diffusion in biologic tissues is non-Gaussian. DWI depends on the the b-values used during acquisition. At b-values lower than 500s/mm² the signal attenuation is bi-exponential and it is influenced by both diffusion and perfusion. At b-values higher than 1000 s/mm² the signal attenuation is influenced by restricted water diffusion and hence allows a non-Gaussian distribution. Diffusion Kurtosis Imaging (DKI) provides quantifiable information about the deviation from Gaussian distribution in water diffusion processes. Our aim was to use DKI in different pediatric brain pathologies in order to evaluate its feasibility in detecting those pathologies.

METHOD AND MATERIALS

The method is an extension of conventional DWI that requires higher b-values. We used 5 b-values: from 0 to 2500 s/mm² with step 500. Fitting all b-values we were able to discriminate Diffusion and kurtosis parameters. We modified image post-processing procedure and we developed home made software for post-processing and DWI, ADC, AKC maps. We have examined 47 children (aged 15 days - 14yrs) with different pathologies (12 tumors, 4 vascular, 9 metabolic, 7 cognitive defects) and with no pathology (15).

RESULTS

AKC maps revealed additional information for tissue characterization. For example in hypoxic-ischemic lesions AKC revealed more details about pathologic tissue changes and provided some information about prognosis. In brain tumors, AKC maps were used for discriminating low-grade from high grade lesions showing more accuracy than conventional diffusion parameters. The 15 patients with no pathology were used to create a set of normal values for specific anatomic regions.

CONCLUSION

ADCK and AKC are non invasive methods to study brain lesions in pediatric patients. Our results suggest that these maps provide a more detailed characterization of neural tissue in clinical context.

The post-processing required to generate maps is more time consuming than traditional DWI maps (2 min for each slice) but this acquisition and post-processing method provide more complete characterization of water displacement inside parenchyma in DWI.

CLINICAL RELEVANCE/APPLICATION

The application of DKI in pathological conditions in a pediatric population provides additional information about microstructural tissue changes, differential diagnosis and prognosis.

SSQ17-04 • Alteration of Regional Low-frequency Fluctuation in Very Young Autistic Children: A Sedated-state fMRI Study

Hua Cheng MD (Presenter) ; Jishui Zhang ; Hao Huang PhD ; Gaolang Gong ; Yun Peng MD

PURPOSE

So far, it remains largely unknown how the regional functional patterns are altered in very young autistic children. The present study aims to determine if there are functional changes in social cognition-associated brain areas in autistic patients at very young stage.

METHOD AND MATERIALS

Sedated-state fMRI(S-fMRI) data of 33 treatment-naïve male autism (2-6 years) and 26 age-matched controls were collected from a 3T clinical scanner using EPI sequence. The patients were diagnosed according to the ADI-R. Amplitude of low-frequency fluctuations (ALFF) and fractional ALFF were calculated using the REST software and analyzed in two different frequency bands (slow-5:0.01-0.027 Hz; slow-4: 0.027-0.073 Hz). To detect the group difference of ALFF or fALFF between autistic children and controls, a general linear model were applied to all voxels in grey matter. Statistical significance were determined by a cluster extent threshold of p

RESULTS

We have found significant differences of frequency-dependent ALFF/fALFF in multiple brain regions between autistic children and controls (supplementary Figure) which are associated with social cognition. Compared to controls, the patients showed similar decreased patterns in ALFF of both frequency bands and in fALFF of slow-5 band. Interestingly, ADI-R scores showed significant negative correlation with ALFF of slow-4 band in left temporal gyrus (p=0.01) (supplementary Figure).

CONCLUSION

Our study reveals the abnormalities of functional activity of very young autistic children in multiple brain regions, which possibly underlies core symptoms of autism. The ALFF in left temporal lobe could be an imaging marker for autism evaluation. Therefore, the ALFF/fALFF analysis based on S-fMRI can be utilized as a potential method to evaluate brain functional development in very young children.

CLINICAL RELEVANCE/APPLICATION

The ALFF under sedated state could be a new imaging marker for evaluating functional abnormalities of autism in very young age.

SSQ17-05 • Biotin-responsive Basal Ganglia Disease (BBGD): Neuroimaging Features before and after Treatment

Hassan Kassem MD ; Sari s Alsubhani MBBS, MD (Presenter) ; Sherif Abdelfattah MD, PhD ; Fahad Alsheikh ; Ayman H Gaballah MD, FRCR

PURPOSE

The purpose is to assess the clinical and neuroimaging features of a biotin-responsive basal ganglia disease before and after treatment of a subacute encephalopathy and to compare the disease with the other basal ganglia diseases of childhood

METHOD AND MATERIALS

We retrospectively reviewed the clinical, laboratory and neuroimaging features of fifteen (15) genetically proven cases of biotin-responsive basal ganglia. All patients were of arab ancestry and have consanguineous parents . Recessive genetic defect was detected in all cases. The chemical tests for organic and inorganic toxic compounds were normal in all cases. All patients were presented with recurrent subacute encephalopathy leading to seizures, extrapyramidal symptoms and coma . MRI of the brain were done in all cases at the onset of symptoms and within a few days after the administration of high doses of biotin (5-10 mg/kg/d).

RESULTS

The brain MRI showed bilateral lesions in the caudate heads in all cases with complete or partial involvement of the putamen. The globus pallidus and cerebellum were spared in all patients. In 12 cases, discrete abnormal signal changes were observed in the mesencephalon, cortical-subcortical regions and thalami. In 8 cases when the disease was advanced, patchy white matter disease was found. The high signal abnormality of the mesencephalon and cortical-subcortical areas were disappeared after treatment with biotin and thiamine while the caudate and putamen necrosis remained unchanged in all patients including those who became asymptomatic .

CONCLUSION

The neurological features, control of the disease with biotin and the distinctive MRI features should lead to the diagnosis of BBGD. It is important to check for the presence of this disease in children with acute onset extrapyramidal symptoms as therapeutic trial of biotin and thiamine can be lifesaving .

CLINICAL RELEVANCE/APPLICATION

It is important to check for the presence of this disease in children with acute extrapyramidal symptoms or subacute encephalopathy as it can be managed without further neurological deterioration

SSQ17-06 • Does Ultrasound Texture Analysis of Periventricular White Matter Predict the Periventricular White Matter Injury in Preterm Infants?

Sun Kyoung You MD (Presenter) ; Young-Hun Choi ; Sang-Joon Park BA ; Jung-Eun Cheon MD ; Woo Sun Kim MD ; In-One Kim MD

PURPOSE

Periventricular leukomalacia(PVL) is the major cause of neurodevelopmental problems encountered in survivors of premature birth. The aim of this study was to evaluate the ultrasound texture analysis as a potential imaging tool for quantitative assessment of periventricular white matter (PVWM) injury in preterm infants.

METHOD AND MATERIALS

73 preterm infants (median gestational age; 28wks, median birth weight; 905.2g) who were treated in the neonatal intensive care unit and had serial cranial US and brain MR obtained at near term period (38.0 ±3.7wks) were included in our study. Periventricular echogenicity (PVE) on serial cranial US were evaluated qualitatively by visual grading as grade 1, 2, and 3 compared to echogenicity of the choroid plexus and quantitatively using Gray Level Co-occurrence Matrix (GLCM) method; a second order statistical method of texture analysis. These features were selected based on empirical observation that the normal PVWM exhibits homogeneous echotexture, whereas the ischemic PVWM often exhibits heterogeneous echotexture. Four GLCM textural features which represent homogeneity of an image was measured: (1) angular second moment (ASM), (2) inverse differential moment (IDM), (3)contrast, and (4) entropy. Quantitative and qualitative US features of PVE were compared between two groups (group 1: PVL on MRI(10), group 2; no PVWM abnormality on MRI(63)).

RESULTS

All GLCM features did not show statistically significant difference between two groups, although mean value of ASM and IDM were higher in group 1 than those of group 2 (ASM p-value ; 0.176, IDM p-value ; 0.52). Contrast (degree of heterogeneity) and entropy (degree of randomness) were lower in group 1 than those of group 2 (contrast p-value; 0.68, entropy p-value; 0.221). IDM and entropy values of PVE grade 1 (less than choroid plexus) showed statistically significant difference between two groups. (IDM p-value ; 0.006, entropy p-value;

CONCLUSION

Texture analysis using GLCM matrix method may serve as a complementary tool for quantitative assessment of PVE in selected cases of increased PVE. It is still questionable whether US screening of PVWM in premature infants can be a sensitive predictor of the PVWM injury in preterm infants.

CLINICAL RELEVANCE/APPLICATION

Off-line texture analysis of PVE utilizing GLCM matrix might be a complementary tool for quantitative approach to vulnerable brain structures in preterm infants

SSQ17-07 • Amide Proton Transfer MR Imaging of the Brain in Children at 3T: A Preliminary Study

Hong Zhang MD (Presenter) ; Jinyuan Zhou PhD ; Na X Zhao PhD ; Yun Peng MD

PURPOSE

APT imaging is able to extend the achievable magnetic resonance imaging (MRI) contrast to the protein level. The aim of this study was to investigate APT effect in healthy children.

METHOD AND MATERIALS

Nineteen healthy children were investigated. All subjects were scanned on a Philips 3T MRI scanner (Achieva 3.0T TX). Single-slice APT imaging was acquired. All data processing procedures were performed using the interactive data language (IDL). The $MTR_{asym}(3.5 \text{ ppm})$ image was calculated. Regions of interest were carefully chosen by experienced radiologists. The regions of interest were drawn on relatively homogeneous white and gray matters of bilateral cerebral hemispheres. SPSS11.5 for Windows was used for data analysis. The distribution of the data was tested for using the Shapiro-Wilk normality test. All values are expressed as mean±standard deviation. Then, paired t-test was done to show if there was significant difference in $MTR_{asym}(3.5 \text{ ppm})$ values between white and gray matters. Statistical significance was accepted at $p < 0.05$.

RESULTS

Fig.1 shows an example of APT images for a volunteer. As shown in Fig.1, the APT signal intensities was greater in gray matter compared to white matter in volunteers. There was no statistically significant difference between the left and the right side of the brain in volunteers. So, the values from both sides were combined. The units of APT are percentage points in the water signal intensity, the values are -0.62 ± 0.20 (white matter) and 0.25 ± 0.34 (gray matter). There was statistically significant difference of APT signal intensities between white and gray matters. ($t = -12.24, p = 0.000$).

CONCLUSION

We have demonstrated the feasibility of APT imaging of normal brain in healthy children on a clinical 3T scanner. APT imaging at 3T revealed significant contrast between white and gray matters, with a higher APT signal apparent within the gray matter. These preliminary data from healthy children show that the APT is a unique contrast that can provide complementary information to standard clinical MRI measures.

CLINICAL RELEVANCE/APPLICATION

APT imaging is able to extend the achievable MRI contrast to the protein level. We believe that APT imaging at 3T has the potential to become a noninvasive biomarker for some pediatric diseases.

SSQ17-08 • A Novel MRI Sequence (“Black Bone”) Offering an Alternative to Ionising Radiation in the Investigation of Craniosynostosis

Karen A Eley MBBCh, DPhil (Presenter) ; **Fintan Sheerin** MBBCh ; **Stephen R Watt-Smith** MD, MBBS ; **Stephen J Golding** MD

PURPOSE

“Black Bone” MRI is a novel gradient echo sequence providing improved definition of the bone-soft tissue margin by minimising soft tissue contrast. We sought to determine the potential of “Black Bone” MRI as a non-ionising alternative to CT in the identification of cranial sutures and diagnosis of craniosynostosis.

METHOD AND MATERIALS

A prospective study of 4 children with normal cranial sutures and 13 children with a clinical diagnosis of craniosynostosis was conducted following initial investigation of the “Black Bone” sequence in an animal model. Normal cranial sutures were assessed by measurement of suture widths with reference to normative data. “Black Bone” datasets in the 13 children with craniosynostosis were compared to CT and clinical findings. Blinded review of 12 “Black Bone” datasets from children was completed by 3 assessors, grading each cranial suture on a scale of 0 to 2. To provide comparable imaging to CT and enhance visualisation of the cranial sutures, techniques were developed to produce three-dimensional rendered images of the craniofacial skeleton.

RESULTS

Patent cranial sutures were consistently identified on the “Black Bone” datasets as areas of increased signal distinguished from the signal void of the cranial bone. In children with craniosynostosis the affected suture was absent, whilst the remaining patent sutures could be visualised. These findings were consistent with those on CT. On independent review, synostosed sutures received the lowest mean scores. Three-dimensional rendered images permitted visualisation of the cranial sutures throughout their course.

CONCLUSION

Patent cranial sutures appear as areas of increased signal on “Black Bone” MRI clearly distinguished from the cranial bone. The sequence accurately differentiates the normal suture from the prematurely fused, demonstrating considerable clinical potential as a non-ionising alternative to CT in the diagnosis of craniosynostosis.

CLINICAL RELEVANCE/APPLICATION

“Black Bone” MRI offers a non-ionising alternative to CT in the investigation of craniosynostosis, with the ability to produce three-dimensionally rendered images to enhance diagnostic capabilities.

SSQ17-09 • Low-dose Temporal Bone CT in Children: Feasibility and Image Quality

Hui Zheng (Presenter) ; **Yuhua Li** ; **Wenjun Cao** ; **Ming Liu** ; **Dengbin Wang** MD, PhD

PURPOSE

To evaluate the visualization of the temporal bone using low-dose 256-slice CT, we scanned one exsomatized cadaveric head at multiple levels of mAs and kV. This optimized protocol was used to examine pediatric patients. We analyzed the feasibility of low dose temporal bone CT in children and evaluate the image quality and radiation dose of a low-dose versus.

METHOD AND MATERIALS

One exsomatized cadaveric head was scanned repeatedly at three levels tube tensions from 120 to 80kV. And at every kV, multiple mAs were used from 250mAs until the image quality was insufficient. Noise was measured as the standard deviation in HU within the region the brain stem. All databases were subjectively evaluated by 2 experienced radiologists. The visibility of 16 anatomical landmarks was scored using a five point scale. The noise and effective dose were compared with each other. The optimized low dose protocol was used to examine 27 consecutive children. We retrospectively analyzed 36 examinations underwent a standard temporal bone CT acquired with 120kV, 250mAs. The image quality and the effective dose were analyzed. Image quality score frequencies were calculated for each group. The children were then divided into 5 groups according to age-specific effective dose conversion coefficient. The effective dose of different age groups were compared in both low and high protocol. And then we compared the effective dose between the two protocols at the same age.

RESULTS

CT radiation dose was significantly reduced when the parameters was selected 100kV, 70mAs. Most of the anatomical landmarks were delineated no significantly difference though the increased noise. The frequency of score 5 was significantly lower for the low-dose scans versus high, however the frequency of 4 was significantly higher. The frequency of the scores 1 and 2 was none for both protocols.

CONCLUSION

Low-dose temporal bone CT scans allow an accurate evaluation of middle and inner ear structures in children though reduced image quality compared with that in high-dose scans. The radiation dose was 5~6 times below standard protocol used in daily work. The effective dose for infants is higher than the older children underwent the same protocol.

CLINICAL RELEVANCE/APPLICATION

Postoperative CT of cochlear implants should provide information on the precise localization of the implant and its individual electrode.

SSQ18 • AMA :1.5 • ARRT:1.5

Moderator
Donald P Frush, MD
Moderator
Bernard F Laya, DO

SSQ18-01 • Patient-Specific CT Dose Maps (CTDM) and Patient-Specific Dose Estimates (PSDE) for Pediatric CT: Preliminary Results in Comparison with the CTDIvol and Size Specific Dose Estimate (SSDE)

Dianna M Bardo MD (Presenter) * ; **Jeffrey H Yanof** PhD ; **Donna M Stevens** MS ; **Efrat Shefer** PhD * ; **Galit Kafri** PhD * ; **Jens Wiegert** PhD *

PURPOSE

This study aims to investigate PSDE which considers individual body habitus, attenuation /absorption characteristics of tissue and material included in pediatric CT using a Monte-Carlo simulation tool. Another aim is to devise a method to determine CT dose from scatter radiation and the proportion of scatter to displayed CTDIvol. Measures of all components of CT radiation; direct beam, over-ranging, and scatter are made with improved accuracy to produce a PDSE dose profile and compared to SSDE and CTDIvol.

METHOD AND MATERIALS

IRB approval was granted to review 15 pediatric CT and CTA exams, 8 male, 7 female, ages 6 days to 15 years. HU of each image voxel was used to categorize tissues into 6 material classes based on physical composition and chemical stoichiometry. PSDEs were computed from voxelized CTDMs using the Monte-Carlo method, integrating dose or energy in individual patients, taking into account tissue density. A Student's paired T-test was used to compare the mean values of CTDIvol-normalized PSDE and SSDE for chest and abdomen regions. Display of radiation dose in CTDMs is designed to visually indicate areas of greater and lesser dose on a color scale, with scatter dose displayed separately and in total.

RESULTS

CTDMs show that dose generally increases with decreasing patient size. The general trend of average normalized dose vs. patient size tends to agree with the SSDE. The calculated PSDE dose profile is greater in smaller diameter patients. Patient specific dose profiles of PSDE vary along the z-axis indicating variation of dose throughout the irradiated volume which depends on effective diameter, tissue type and position within the irradiation field. PSDE values for infant chest/cardiac CTA exams were greater than CTDI-normalized SSDE. In older/larger patients, increased diameter, which increases attenuation of x-rays, skews the PSDE less than the SSDE.

CONCLUSION

PSDE provides an accurate and individualized measure of radiation dose imparted during CT scan. CTDMs depict dose distribution within each slice. CTDMs and PSDE enable understanding of dose in different tissues, using varied scan protocols and are especially important in understanding imparted CT dose in infants.

CLINICAL RELEVANCE/APPLICATION

The importance of accurate, patient specific dose estimation and reporting in the youngest and smallest patients is most vital. In children, the accurate estimation and calculation of dose in clinics

SSQ18-02 • Reduction of Radiation Exposure, Effective Dose and Organ Dose in Pediatric Body CT Using BMI-based kVp Adjustment

Vana M Derderian BS (Presenter) ; **Jenifer W Siegelman** MD, MPH ; **Choonsik Lee** PhD ; **Elizabeth C Jones** MD ; **Mahadevappa Mahesh** MS, PhD * ; **Les R Folio** DO, MPH

PURPOSE

Understanding organ dose from CT in the context of age and body size is evolving. As part of efforts to balance CT radiation risk and its diagnostic benefit, we assessed the effectiveness of a BMI-based (Body Mass Index) kVp adjustment on dose in a pediatric cohort over time. We compared exposure and calculated patient-specific organ and effective dose from long z-axis exams in children before and after kVp reduction.

METHOD AND MATERIALS

To evaluate the effectiveness of BMI-based kVp adjustment, we retrospectively reviewed all kVp-adjusted CT scans in children (2012; n=358). Scans with kVp-adjusted Chest, Abdomen and Pelvis (CAP) or CAP with neck with one or more scans covering the same region prior to 2011 (program implementation) were included (n=13). Technical parameters (kVp, mAs, automatic exposure control (AEC) use) as well as exposure data (CTDI_{vol}, DLP) from four CT units extracted from Radiance/PACS were compared with SSDE (Size Specific Dose Estimate) effective diameter at the middle slice, organ and effective doses at two time points (2010 and 2012). Computational phantoms representing six different age groups (newborn to adult) and two genders were used for Monte Carlo simulation of organ dose. Radiologists and ordering physicians monitored studies for clinically relevant (subjective) reductions in quality. Repeat rate due to inadequate quality was collected.

RESULTS

Comparing 2012 with 2010 as baseline, CTDI_{vol}, DLP, and SSDE in 2012 were 22% ($p=0.082$), 20% ($p=0.2982$), and 26% ($p=0.012$) lower on average. Organ doses in 2012 were on average 26% ($p=0.012$) lower than baseline, similar to the reduction seen in SSDE. Urinary bladder and active marrow showed the maximum (28%) and minimum reduction (25%), respectively. No studies were repeated; no additional costs were incurred.

CONCLUSION

SSDE and average organ doses were, on average, 26% reduced after BMI-dependent kVp adjusted scans in 13 children. Use of BMI-based kVp adjustment is an economical dose reduction method that can maintain quality.

CLINICAL RELEVANCE/APPLICATION

Economical radiation dose reduction and organ dose estimation methods should help pediatric dose optimization efforts in hospitals and clinics without additional capital or infrastructure investment.

SSQ18-03 • High-pitch Dual Source Computed Tomography of Pediatric Abdomen

Eray Atli MD (Presenter) ; **Erhan Akpınar** MD ; **Berna Sayan Oguz** MD ; **Mithat Haliloglu** MD

PURPOSE

To assess radiation dose reduction and image quality with high-pitch dual-source CT (DSCT) in comparison with standard pitch with conventional pediatric abdominal CT.

METHOD AND MATERIALS

A total of 48 patients (median age, 51.8 months) underwent high-pitch abdominal CT in this institutional review board-approved HIPAA-compliant prospective study. High-pitch (value:3) mode CT was performed with 64-slice DSCT. This was compared to a group of 37 patients (median age, 60.7 months) who underwent conventional pediatric abdominal CT (pitch:

RESULTS

Both patient groups were similar with respect to age, APD, LD, ED and SL. Mean ST of high-pitch abdomen CT was 1.57 secs, while it was 9.94 secs in standard pitch mode CT. In comparison with conventional pitch mode, high pitch mode of DSCT reduced radiation exposure by 67% (5.18 vs. 1.7 mGy, SSDE according to ED); CTDI_{vol}, DLE and SSDE parameters were significantly lower in high pitch mode

(p)
CONCLUSION

The use of high pitch DSCT significantly decreases scan times and radiation exposure when compared to conventional CT. Image quality and diagnostic confidence, however, is still similar in both imaging techniques.

CLINICAL RELEVANCE/APPLICATION

In pediatric abdominal imaging, high pitch DSCT provides fast scanning, less motion artifacts and significant reductions in radiation exposure without adversely affecting image quality.

SSQ18-04 • Dose Reduction in Pediatric Body-CT due to Fully-integrated-Digital 'Stellar®' Detector

Jennifer L Cullmann (Presenter) ; **Khoschy Schawkat** MD ; **Daniel Ott** MD ; **Stefan Puig** MD, MSc

PURPOSE

To evaluate the potential reduction of radiation dose in pediatric body CTs after implementation of a new fully-integrated-digital detector (Stellar♦, Siemens Healthcare, Germany) compared with a conventional ♦Ultra-Fast-Ceramic♦ (UFC) solid-state-detector.

METHOD AND MATERIALS

152 routine CT examinations (112 thoracic, 8 abdominal and 32 thoracoabdominal) of 114 children (58 male, 56 female) between 1 day and 16 years of age were included in the analysis. The following parameters were recorded: age, scan length, maximum body diameter, and CTDIvol, dose-length-product (DLP). The effective radiation dose (ED) was estimated from the DLP and an organ weighting factor (k): $ED[mSv] = k \times DLP[mGy \times cm]$. All examinations were performed on a single dual source multi-detector CT (Somatom Definition Flash; Siemens Healthcare, Erlangen, Germany), 93 examinations before the exchange of the detector unit, with a UFC solid-state-detector, and 59 with the new digital Stellar♦-detector. The scanning protocols were kept the same before and after replacement of the detector unit. Independent two-sample t-tests were used to assess statistical differences, the level of significance was defined as $p = .05$.

RESULTS

Age and body diameter did not show significant differences in both groups. The mean CTDIvol was about 16% lower after detector change (1.77 vs. 1.52 mSv). However, this difference was statistically not significant ($p=.30$). The mean ED was significantly lower with the digital Stellar detector ($0.74 mSv \pm .6$) compared with the previous UFC solid-state-detector ($1.09 mSv \pm 1.3$) ($p=0.02$). This was obviously mainly achieved due to a significantly lower mean scan-length of $270 mm \pm 123.6$ vs. $231mm \pm 89.5$ ($p=.3$) resulting in a significantly lower DLP: $70.2 mGy \times cm \pm 88.4$ vs. $45.2 mGy \times cm \pm 41.6$ ($p=.02$).

CONCLUSION

Fully digital Stellar♦ detector may achieve a mild reduction of radiation in pediatric patients. However, the main difference of the DLP was due to differences of the scan length before and after exchange of the detector unit.

CLINICAL RELEVANCE/APPLICATION

There may be some radiation dose reduction due to fully digital detectors. However, other factors such as scan length still have a major influence on radiation dose.

SSQ18-05 • Pediatric CT Radiation Dose Variability: Affecting Factors at a Large Academic Institute

Ranish D Khawaja MBBS, MD (Presenter) ; **Sarabjeet Singh** MD ; **Beth Vettiyil** MBBS ; **Sarvenaz Pourjabbar** MD ; **Atul Padole** MD ; **Mannudeep K Kalra** MD * ; **Diego A Lira** MD

PURPOSE

Children are more susceptible to radiation-induced carcinogenesis because of greater organ radiosensitivity and a longer life-span. Since children have a wide variability in their body sizes and expected variations in radiation doses, we aimed to compare pediatric CT radiation doses across different *body weight* groups and across *scanners*, *operators* and *body regions* in pediatric CT.

METHOD AND MATERIALS

In an IRB-approved study, 544 consecutive pediatric (= 18years) chest (C) and abdomen-pelvis (A) CT ($n_C=204$; $n_A=340$; M:F=309:235) were assessed with a web based dose monitoring software (Exposure, Radimetrics) from 1/2011 to 1/2013. Demographics of patient (age, sex, body weight, and body diameter); body regions; age, sex, training experience of CT technologist, scanner type (availability of Iterative Reconstruction ♦IR♦), off-centering, and estimated effective dose (EED) were recorded. Corresponding EED values were also recorded for adult CT ($n=14,000$; $n_C=6,000$; $n_A=8,000$) for comparison. Analysis of variance (ANOVA) was used to evaluate differences in ED across above variables. P

RESULTS

Mean EED (ICRP-103) in pediatric cohort was 6.9 ± 6.5 ($EED_C: 4.7 \pm 5.3$; $EED_A: 8.1 \pm 6.8$; mean age: 12.0 ± 5.0 years). Compared to adults mean EED was 7.4 ± 4.1 ($EED_C: 4.6 \pm 2.7$; $EED_A: 10.2 \pm 5.5$). Mean EED for pediatric abdominal CT was significantly low compared corresponding adult dose (p

CONCLUSION

Mean ED varies considerably across CT scanners, body regions and with BW in pediatric patients. Mean ED varies significantly in children weighing 27-100Kg across scanners. This variability is low for lightweight (

CLINICAL RELEVANCE/APPLICATION

In our experience of pediatric CT, the only modifiers that affect the radiation dose variability include CT exam performed on IR versus non-IR scanners, and body weight of patient.

SSQ18-06 • Is Wide-detector Better than Helical Acquisition in Children Undergoing Torso CT Imaging?

Robert F Buchmann DO (Presenter) ; **S. Bruce Greenberg** MD

PURPOSE

We have shown a 45% reduction in radiation exposure with no loss in image quality for torso CT imaging of children by shifting from filtered back projection to Adaptive Iterative Dose Reduction (AIDR 3D). Our purpose was to evaluate if additional dose reduction or improved image quality could be obtained by changing from helical to wide-detector technique.

METHOD AND MATERIALS

The study groups include 100 children who had undergone helical torso CT and 50 who had undergone wide-detector torso CT. Wide-detector technique is a step and shoot technique that allows for up to 16cm of coverage per rotation with stitching of multiple rotation acquisitions. The helical group average age was 9.4 years (SD 5.7) and the wide-detector group 10.0 years (SD 5.9) which was not significantly different ($p = 0.54$). Size-Specific Dose Estimates (SSDE) were calculated for each study. Image noise was used as a proxy for image quality. Three 1.0 cm² round regions of interest (ROI) were created, two in the right paraspinal muscles at the levels of the right pulmonary artery and the right kidney and one in the right gluteus maximus muscle. The standard deviation in each ROI constituted the measure of image noise. Unpaired t tests compared the SSDE and image noise for each group.

RESULTS

The results are summarized in the table. No significant difference in the SSDE was present between the two study groups ($p = 0.58$). Children less than 7 years old undergoing wide-detector acquisition had a mean SSDE of 2.8 mGy (SD 0.5) while those undergoing helical acquisition had a mean SSDE of 3.2 mGy (SD 0.9). This difference was not significant ($p = 0.09$) but showed a trend towards reduced dose in younger children. Image noise in the abdomen was improved by wide-detector technique, but the difference was not significant ($p = 0.18$). A 7% reduction in pelvis image noise by wide-detector technique was significant ($p = 0.04$).

CONCLUSION

Radiation exposure was not significantly improved by the use of wide-detector scanning, but a trend towards modest improvement in

younger, smaller children was observed. Pelvis image quality was significantly improved and a trend towards improvement in the abdomen was observed. Helical images are likely to have increased noise compared to wide-detector technique due to inherent smearing associated with helical technique.

CLINICAL RELEVANCE/APPLICATION

The information acquired allows for optimization of computed tomography in children.

SSQ18-07 • Usefulness of Large Beam-shaping Filters at Different Tube Voltages of Pediatric CT

Takanori Masuda (Presenter) ; **Yoshinori Funama** PhD ; **Naoyuki Imada** ; **Takayuki Oku** ; **Satoshi Inada** ; **Kazuo Awai** MD *

PURPOSE

As children are more susceptible to radiation-induced damage than adults it is necessary to use a lower radiation dose at pediatric CT. An effective reduction methods is the selection of large beam-shaping filters. We compared the radiation dose with small and large beam-shaping filters at different tube voltages and document the usefulness of large beam-shaping filters at pediatric CT.

METHOD AND MATERIALS

We used a 15-cm diameter cylindrical water phantom and inserted a 10-cm long pencil ionization chamber into the phantom center. Helical CT acquisitions were on a 64-detector CT scanner (VCT, GE Healthcare). The tube voltage was 80-, 100-, or 120 kVp; the beam pitch and gantry rotation time were 1.375 and 0.4 sec. The tube current was automatically set with automatic exposure control (noise index: 10 HU). The field-of-view (FOV) was 15- and 50 cm with small and large beam-shaping filters, respectively. Scans with a 50-cm FOV were reconstructed at a 15-cm display FOV. The radiation dose and image noise (SD of the CT number) were compared on all reconstructed images.

RESULTS

The radiation dose with the small beam-shaping filter was 2.08 mGy at 80-, 2.07 mGy at 100-, and 2.24 mGy at 120 kVp, respectively. With the large filter it was decreased to 1.9, 1.94, and 1.77 mGy at 80-, 100-, and 120 kVp. At each tube voltage the radiation dose was lower with the large- than the small filter. The image noise was 8.42 HU at 80-, 8.34 HU at 100-, and 8.26 HU at 120 kVp with the small filter, respectively; with the large filter it was 8.52, 8.23, and 8.45 HU. There was no significant difference in image noise between small and large beam-shaping filters at all tube voltages ($p > 0.05$).

CONCLUSION

The use of a large beam-shaping filter facilitates, radiation dose reductions by 10-20% without image quality degradation at pediatric CT.

CLINICAL RELEVANCE/APPLICATION

Large beam-shaping filters help to reduce the radiation dose at 64-detector CT, eliminating the need for investments in new technology.

SSQ18-08 • Organ and Effective Doses in Dual-energy CT of Pediatric Contrast-enhanced Examinations: Comparison to Single-energy CT Using Low Tube Potential

Juan Carlos Ramirez Giraldo PhD (Presenter) ; **Marilyn J Siegel** MD * ; **R Bankwitz** * ; **Marga Leuthe** * ; **Bernhard Schmidt** PhD *

PURPOSE

To evaluate the organ and effective doses of dual-energy CT (DECT) in pediatric-sized phantoms in comparison to low tube potential single-energy CT (SECT) with the same radiation output.

METHOD AND MATERIALS

Two anthropomorphic phantoms simulating a 1 year-old and a 5 year-old that had inserted thermoluminescent dosimeters (TLDs) were scanned using a dual-source 128-slice CT system operated with conventional SECT at low tube potential and also DECT at 80/140 kVp with tin filtration. The scan range included both abdomen and pelvis. For the SECT scans, the tube potential and corresponding tube current were selected by using an automated tube potential selection tool (CARE kV), using 120 kVp and 150 mAs as reference, with optimization for CT angiography. The scanner output, as measured by the volume CT dose index (CTDI_{vol}), was recorded and used to adjust the mAs in the DECT scans such that CTDI_{vol} was the same as the SECT scan. Organ doses in mGy were measured and the effective dose in mSv was calculated by summing the absorbed doses (mGy) of individual organs considering ICRP103 weighting factors.

RESULTS

The resulting CTDI_{vol} values were 0.67 mGy and 2.73 mGy for the 1 year-old and 5 year-old phantoms, respectively. The calculated effective doses were 1 and 1 mSv (1 year-old), and 3 and 3 mSv (5 year-old) for the 80 kVp and 80/140 kVp scans, respectively. In the 1 year-old phantom, organ doses were statistically the same with average difference of 0.11 mGy ($P=0.07$) between 80 kVp and 80/140 kVp. In the 5 year-old phantom, organ doses were also statistically the same with average difference of 0.35 mGy ($P=0.15$) between 80 kVp and 80/140 kVp.

CONCLUSION

At matched radiation scanner output, organ and effective doses of DECT scans are comparable to those from conventional SECT at a low tube potential of 80 kVp.

CLINICAL RELEVANCE/APPLICATION

The ability of DECT to achieve comparable organ and effective doses relative to optimized low-tube potential CT angiography in pediatrics, is a pre-requisite for consideration of its use clinically.

SSQ18-09 • The Optimal Dose Reduction Level in Chest CT with 640-slice CT Volume Scan Mode Using Iterative Reconstruction (AIDR 3D) in Little Swine Model

Qin Liu MA, BA (Presenter) ; **Yang Hou** MD ; **Pengfei Zhao** ; **Qiyong Guo** MD

PURPOSE

To evaluate the radiation dose and image quality (IQ) of an iterative reconstruction (AIDR 3D) in combination with SureExposure^{3D} on a 640-slice CT and determine the optimal dose reduction using AIDR 3D for neonates and children chest CT that can provide IQ comparable to filtered back projection (FBP).

METHOD AND MATERIALS

29 normal swines whose weight ranged 3-12kg (7.62 ± 2.67) underwent 640-slice MDCT chest CT (Aquilion one, Toshiba) for 5 times with 80kvp and different mAs. SureExposure^{3D} technique were used and the index of noise were set to SD10 (Group A, routine dose), SD12.5, SD15, SD17.5, SD20 (Group B-E) to reduce dose successively. Group A were reconstructed with FBP, Group B-E were reconstructed using AIDR 3D (strong level). Two radiologists graded subject image quality in both lung and mediastinal images using a 5-point scale in a blinded manner. Object IQ parameters of image noise, signal-to-noise (SNR) were measured in each group. A receiver-operating characteristic (ROC) analysis was performed to establish a radiation reduction threshold up to which comparable IQ (score=4) was maintained.

RESULTS

Group B, C, D has significantly lower noise, better SNR than Group A (P

CONCLUSION

Using AIDR 3D technique, 80kvp with SureExposure^{3D} (SD17.5) can provide comparable or even better IQ compared with routine dose with FBP reconstruction, and reduce 43% dose in little swine model.

CLINICAL RELEVANCE/APPLICATION

The results of little swine model may be applied to reducing radiation dose of chest CT in neonates and children with serious lung infections.

Pediatric Radiology -Thursday Posters and Exhibits (12:15pm - 12:45pm)

Thursday, 12:15 PM - 12:45 PM • S101AB

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PD

CL-PDS-THA • AMA PRA Category 1 Credit™:0.5

Host

Mahesh M Thapa, MD

CL-PDS-TH1A • Osteochondritis Dissecans of the Knee; MRI Guided Retrograde Drilling at 1.5 T and Clinical Outcomes in Pediatric Patients

Matti Vahakari MD (Presenter) ; Pekka Kerimaa MD ; Osmo Tervonen MD, PhD ; Jussi Korhonen MD ; Juha Jaakko Sinikumpu MD ; Risto Ojala MD, PhD ; Roberto Blanco Sequeiros MD

PURPOSE

The purpose of this study was to evaluate the feasibility and clinical results of percutaneous high field MRI-guided retrograde drilling for the treatment of juvenile osteochondritis dissecans (JOCD) of the femur.

METHOD AND MATERIALS

8 JOCD lesions of the femur in seven patients (figure 1A and 1C), unresponsive to prolonged conservative management (6 months), were treated with MRI-guided percutaneous retrograde drilling (figure 1B) to reduce symptoms and to promote ossification of the subchondral lesion. All lesions were of juvenile type OCD (mean age 13 y). Four lesions were located on the the medial condyle and four lesions were located on the lateral condyle. All the patients had severe limitation of activity due to the OCD related pain. The mean size of the lesion was 15mm x 7mm x 15 mm. An 1.5 T wide bore MRI scanner (Siemens Espree, Erlangen, Germany) was used to percutaneously drill retrograde channels to the JOCD lesions (3 mm cylindrical drill, 1-3 channels). MRI imaging was used to guide instruments. Mean postprocedural clinical follow up time was 14 months (minimum 12 months). All patients had a post-procedural follow up MRI within a year.

RESULTS

All the JOCD lesions were successfully located and drilled using the MRI scanner without procedural complications. Mean procedural time was 58 minutes. All the patients had pain relief, mean visual analog score of the maximal associated pain (VAS) declined from 7 to 2. Follow up MRI showed ossification in 5 lesions (figure 1C-D). Five patients could return to normal physical activity with no effect on function (Hughston score 4). Two patients were pain free but experienced some symptoms with physical activity (Hughston score 3).

CONCLUSION

MR-guided retrograde drilling is accurate and feasible method to achieve therapeutic effect in the treatment of the juvenile OCD lesion of the femur.

CLINICAL RELEVANCE/APPLICATION

MRI guided retrograde drilling is potentially a paradigm shifting minimally invasive method to treat JOCD with no associated ionizing radiation, a significant benefit in pediatric population.

CL-PDS-TH2A • Ultra Low Dose Imaging for the Follow up of Idiopathic Scoliosis: How Low is Reasonably Achievable with New Slot-scan Technology ?

Marianne Alison MD, PhD (Presenter) ; Emmanuelle Ferrero ; Anca S Tanase MD ; Adelaide Rega ; Brice Ilhareborde ; Kevan Mazda MD, PhD ; Guy H Sebag MD

PURPOSE

For the follow up of spinal deformities, a novel biplanar slot scanning system has been shown to allow significant dose reduction. Further dose reduction can be obtained with recent technical advances (copper filtration and dedicated image processing) and with the optimization of the acquisition parameters (kV, mA and scan speed). Our aim was to assess the image quality as well as the reproducibility of clinical parameter measurements using an optimized ultra low dose protocol for scoliosis examinations

METHOD AND MATERIALS

23 patients (mean age: 12.4 yo ± 3.3, range 5-18yo) with mild or moderate idiopathic scoliosis were imaged with an ultra low dose protocol optimized according to the body mass index, following the ALARA concept. Dose Area product (DAP) and entrance dose (kerma) were quantified for each examination. Image quality was rated on a 5-point scale based on the visibility of the edges of the vertebrae of 5 different anatomical areas (cervical, superior and inferior thoracic and lumbar spine), 5 corresponding to the highest quality. Cobb angle, cervical and lumbar lordosis, thoracic kyphosis, pelvic parameters (pelvic incidence, sacral slope) were measured by two independent operators (radiologist and orthopedist). The intraclass correlation coefficient (ICC) was used to assess interobserver agreement of the measurements.

RESULTS

Mean (±SD) Cobb angle was 22.3 (± 13)°. Mean DAP was 39.5 (± 17.1) and 87.9 (± 31.7) mGy.cm² for the antero posterior (AP) and the lateral view respectively. Mean entrance doses was 17.6 (±6.4) and 42.1(±12.8) mGy for the AP and the lateral view respectively. This dose corresponds to approximately 10 days of background radiation. Image quality was graded 3 in 11/23 (48%) cases, 4 in 11/23 (48%) cases and 5 in 1/23 (4%) case. Interobserver agreement was very high for Cobb angle (ICC 0.92), T1-T12 kyphosis (ICC 0.90) and L1-S1 lordosis (ICC 0.90) and high for cervical lordosis (ICC 0.89), T4-T12 kyphosis (ICC 0.89), pelvic incidence (ICC 0.88) and sacral slope (ICC 0.83).

CONCLUSION

Ultra low dose imaging is achievable for the follow up of idiopathic scoliosis, with acceptable image quality and high reproducibility of the measurements.

CLINICAL RELEVANCE/APPLICATION

Ultra low dose protocol using biplanar slot scanning system with optimized acquisition parameters can be used for the monitoring of idiopathic scoliosis, allowing further dose reduction

CL-PDS-TH3A • MRI-based 3D Virtual Arthroscopy for Anatomic ACL Reconstruction in Pediatric Patients: Does a High-resolution 3D Base MRI Sequence Improve ACL Attachment Site Localization?

Vimarsha G Swami BSC (Presenter) ; June Cheng-Baron PhD ; Catherine Hui MD ; Richard Thompson PhD ; Jacob L Jaremko MD

PURPOSE

Anatomic placement of anterior cruciate ligament (ACL) grafts at arthroscopic reconstruction can be challenging. We developed a novel technique to localize ACL attachments on magnetic resonance imaging (MRI) sequences, and from these produce three-dimensional (3D) reconstructions to visualize the attachment sites in an interactive patient-specific "virtual arthroscopy" environment. ACL attachments can be identified on conventional two-dimensional (2D) MRI sequences, but slice thickness theoretically limits out-of-plane accuracy. We tested whether high-resolution 3D sequences improved reliability of ACL attachment localization compared to conventional 2D MRI.

METHOD AND MATERIALS

Eight pediatric knees were scanned at 1.5 Tesla with multi-planar 2D proton density (PD) sequences (slice thickness 3-4 mm) and T2-weighted 3D multiple-echo data image combination (MEDIC) gradient echo (GRE) sequence (isotropic 0.8 mm voxels). Based on points identified separately by two observers, ACL attachment centre locations in 3D and their areas were calculated, and reliability assessed.

RESULTS

CONCLUSION

ACL attachments were localized with high and similar reliability on 3D MEDIC GRE sequences and multi-planar routine 2D PD sequences.

CLINICAL RELEVANCE/APPLICATION

MRI localization of ACL attachments for "virtual arthroscopy" based on 3D reconstruction has potential to assist anatomic ACL reconstruction, whether from 2D or 3D base sequences.

CL-PDS-TH4A • Brain MRS Change and Its Correlation with Neurological Appearance in Children Patients with Gaucher Disease Type 1

Yue Liu MD (Presenter) ; Chuankai Lv ; Shuangfeng Yang ; Yun Peng MD

PURPOSE

Gaucher's diseases (GD) are rare progressive inherited disorders of glycosphingolipid metabolism that affect multiple organ systems. It has three classic variants based on the presence or absence of neurological manifestations and their rate of progression. Gaucher Type 1 (GD1) is by far the most prevalent and is characterized by sparing of the central nervous system (CNS) from the primary effects of glycolipid accumulation. But about 35% of children had significant growth retardation. The aim of this study was to investigate evidence for metabolic changes and the correlation with clinical score in the central nervous system for type 1 disease using in vivo MRS.

METHOD AND MATERIALS

Twenty one (21) 5-16-year-old type 1 GD children (13 boys and 8 girls with a mean age of 10.67±3.47 years). In the 21 cases, 11 cases have clinical appearance, the severity scoring tool (SST) were from 3 to 25.5 and the mean score of 8.59±6.58, the remaining are zero score. The age and sex-matched healthy control group include 17 cases (8 boys and 9 girls, age from 5-16 years and mean age of 10±3.53 years). All MRI and 1H-MRS measurements were performed using a Philips Achieva 3.0-T MR scanner. All the MRS raw data were evaluated using MRS processing functions on a Philips workstation. We analysed 6 centrally localized VOIs in cortex, subcortical white matter (WM) and WM within the 20 × 17 CSI matrix with a qualitative analysis of Choline (Cho), N-acetyl-aspartate (NAA), Creatine (Cr). Statistical analysis: SPSS 13.0 for Windows was used for data analysis. The ratios including NAA/Cr, Cho/Cr, Cho/NAA in the two groups were compared by independent sample t tests. Relationships between MRS ratios and SST were determined by Pearson's correlation coefficients controlling for age and gender. Statistical significance was accepted at p

RESULTS

The MRSI-measurement protocol applied in this study was restricted to a small, homogeneous fraction of the brain. We found no statistical differences between the healthy subjects and GD1 patients in any metabolite ratios. No significant correlation of metabolite ratios and SST was found in GD1 patients with neurological score (SST) ($p > 0.05$).

CONCLUSION

CLINICAL RELEVANCE/APPLICATION

The study makes the foundation for the further study for brain metabolic change in GD1 childrens.

CL-PDS-TH5A • Brain Temperature Determination in Newborns with Suspected Hypoxic-ischemic Injury Undergoing Hypothermia Therapy

Jessica L Wisnowski PhD (Presenter) ; Stefan Bluml PhD ; Tai-Wei Wu ; Ida Ashoori ; Ashok Panigrahy MD ; Claire McLean ; Istvan Seri MD, PhD * ; Marvin D Nelson MD

PURPOSE

To measure absolute temperatures in different brain regions in newborns with suspected hypoxic-ischemic injury (HII) undergoing hypothermia therapy (HT) and to determine to what extent the targeted cooling has been achieved.

METHOD AND MATERIALS

11 patients had MR examination during and after HT treatment, including MR spectroscopy (PRESS, echo time 35 msec) of three brain regions: basal ganglia (BG), thalamus (Thal), parietal grey matter (GM). Spectra were processed offline using iNMR (Mestrelab Research, Molfetta, Italy) and the tissue temperature was determined from the chemical shift difference of the N-acetyl-aspartate peak and the water resonance (figure). All studies were performed on a 3T clinical system (Philips, Achieva). Rectal temperatures during MR scans were recorded. The study was approved by the local IRB.

RESULTS

Mean brain temperature (average BG, Thal, GM) during HT was 1.1 degrees above the rectal temperature 34.1+/-0.9 vs. 33.0+/-0.3, p

CONCLUSION

HT is standard care for infants with suspected HII. While HT reduces incidences of death, it is unclear whether survivors benefit from HT by reduced long-term neurological problems. This study confirms the need to measure the actual brain temperatures instead of proxy rectal temperatures to better understand the impact of HT in different patients and in different brain regions. Long-term follow-up is needed to determine whether temperature itself measured in different brain regions is an indicator for outcome.

CLINICAL RELEVANCE/APPLICATION

HT fails to reduce brain temperatures by the targeted difference and furthermore does not reduce temperatures equally across patients and brain regions.

CL-PDS-TH6A • Estimated Radiation Exposure from Routine Pediatric Radiographs Comparing Computed and Direct Digital Radiography

Christopher Smith MD (Presenter) ; Kathy McKay ; Benvon C Cramer MBBCh

PURPOSE

Digital radiography (DR) has been widely adopted because of its workflow benefits and has also been marketed as having a benefit in terms of dose reduction. The purpose of this study is to determine the estimated radiation dosages to patients associated with pediatric radiographs, comparing computed and digital radiographic systems.

METHOD AND MATERIALS

This is a retrospective and prospective case series of pediatric radiographs performed over a period of two years during a renovation from a CR to a DR digital system. Parameters measured were kVp, mAs and patient weight, sex and age. Estimates of dose were derived from published pediatric conversion factors.

RESULTS

The mean estimated doses associated with a sample of (n=2515) pediatric chest and sinus radiographs taken using CR vs DR systems were .18 vs .09 and .16 vs .07 mSv, respectively (p

CONCLUSION

'Plain film' radiography accounts for the majority of pediatric imaging and there has been a considerable increase in pediatric radiographic volume performed in North America over the past decade. Monitoring and optimization of radiation dose in the pediatric setting is therefore essential. Adoption of DR systems is one way this can be achieved. The type of digital system only explains part of the overall dose variability. Although it was not systematically assessed in this study, a review of dose outliers suggests technique is also an important contributor to dose variability. This study provides important information towards meeting the ALARA principle in the pediatric setting where the risks associated with radiation dose are the greatest.

CLINICAL RELEVANCE/APPLICATION

Radiographic doses are non-trivial and variable across pediatric patients imaged at a single institution. Dose reduction can be achieved through the adoption of direct digital radiographic systems

CL-PDE-TH7A • Placenta Evaluation: Normal and Abnormal Findings by Obstetric Ultrasound and Magnetic Resonance Imaging

Taisa D Gasparetto MD (Presenter) ; Heron Werner MD ; Lorena Arrieta ; Pedro Daltro MD ; Romeu C Domingues MD

PURPOSE/AIM

The placenta serves as the organ providing oxygen and nutrition to the fetus. In cases of placenta pathologies, disturbances in the exchange may lead to intrauterine growth restriction, prematurity and intrauterine fetal death. Although ultrasound and Doppler flow sonography are the gold standard methods to evaluation of the placenta, MRI has become an important tool in the assessment of unclear diagnosis with ultrasound.

CONTENT ORGANIZATION

- Anatomy of the placenta (basal plate, placenta lobule, cotyledon) - Placenta maturation (Grannum-Classification in ultrasound and adaptation to MRI) - Calcification of the placenta - Placental shape - Placental shape abnormalities- circunvalata, bilobata. - Pathologies of the placenta: septal cysts, infarction, trombi, placental lakes, retroplacental hematoma, chorangioma, molar pregnancy, placenta previa, abnormal placental invasion - Umbilical cord: single umbilical artery, hypercoiling umbilical cord, umbilical cord knots, umbilical cord cyst, velamentous cord insertion

SUMMARY

Although US remains the method of choice for fetal evaluation, MRI plays an important role as imaging adjunct in the placenta evaluation, specially due to the large field of view and multiplanar capabilities.

CL-PDE3030-THA • Demystifying Pediatric Neurometabolic Disorders

Tushar Chandra MD (Presenter) ; Teresa G Kelly MD ; Saurabh Guleria MD ; Suyash Mohan MD ; Hervey D Segall MD ; Mohit Maheshwari MD

PURPOSE/AIM

The aim of this exhibit is to provide a succinct review of the spectrum of various metabolism disorders that affect the CNS in pediatric age group. We will elucidate a pattern based approach and describe specific pointers to formulate a diagnosis .

CONTENT ORGANIZATION

1. Relevant anatomy and imaging pearls 2. Clinical considerations: diagnostic clues 2. Metabolic conditions involving the gray matter 3. Metabolic conditions involving the white matter 4. Metabolic conditions involving gray and matter 5. Imaging approach and diagnostic algorithm

SUMMARY

A myriad of metabolic conditions involve the brain in pediatric age group. These include abnormalities of lipid and glycogen storage, mitochondrial disorders, urea cycle disorders and some other rare enzyme deficiencies. Proper diagnosis of these conditions can be very challenging, even for the astute radiologist. Magnetic resonance imaging including spectroscopy is a powerful tool in the study of normal and abnormal brain structure, function and biochemistry. This exhibit attempts to simplify the diagnostic approach to these disorders with a pattern based approach to formulate a differential diagnosis and pointers to a specific diagnosis, whenever possible.

Pediatric Radiology - Thursday Posters and Exhibits (12:45pm - 1:15pm)

Thursday, 12:45 PM - 01:15 PM • S101AB

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CL-PDS-THB • AMA PRA Category 1 Credit™:0.5

CL-PDS-TH1B • Sonographic Diagnosis of Hand Fractures in Children

Floriana Zennaro ; Pierpaolo Guastalla MD ; Elena Neri PhD (Presenter) ; Ingrid Rabach ; Egidio Barbi MD ; Veronica Guastalla ; Chiara Zanchi

PURPOSE

The hand is the most frequently injured part of the body in the pediatric and adolescent age group and standard diagnostic procedure for hand fractures is radiography. Ultrasound has been used to evaluate bony injuries, mainly in adults and for long bone trauma. The aim of our study was to evaluate and confirm the safety and utility of the ultrasound diagnostic procedure in comparison to x-ray diagnosis.

METHOD AND MATERIALS

In this prospective observational double-blinded study we investigated 100 patients between 1 and 17 years presenting to a pediatric emergency department. After clinical assessment, patients with suspected hand fracture (metacarpus and phalanx) first underwent x-ray followed by ultrasound examination with high-frequency linear ultrasound probe, performed by two different blind operators.

RESULTS

Of 100 patients with suspected hand fracture, we found by x-ray 37 patients with phalanx or metacarpal fracture. By ultrasound we detected 35 patients with fractures. In 2 cases ultrasonography was negative while x-ray showed a minimal infraction. In 3 cases resulted negative in a first time by radiological examination and positive by ultrasound, additional x-ray projections confirmed minimal fractures . We calculated for ultrasound a sensitivity of 95% and a specificity of 98%.

CONCLUSION

Ultrasound imaging showed excellent sensitivity and specificity in the diagnosis of hand fractures in children.

CLINICAL RELEVANCE/APPLICATION

Ultrasound imaging of hand fractures could become the first diagnostic approach in pediatric emergency department.

CL-PDS-TH2B • The Role of Interventional Radiology in the Management of Pediatric High-grade Blunt Renal Trauma

Fred L Dawson MD (Presenter) ; Francis E Marshalleck MD ; Boaz Karmazyn MD

PURPOSE

To evaluate the role of interventional radiology in pediatric patients with high-grade (grade 4 and 5) blunt renal trauma.

METHOD AND MATERIALS

We performed a 10 year (from 2003 to 2012) retrospective review of all patients 18 years and younger who underwent an image guided procedure for renal salvage after failure of conservative management for high-grade blunt renal trauma. Patients were identified from the radiology information system and the medical records were reviewed for clinical presentation, hospital course including complications and indications for image guided procedures. Interventional radiology procedures that were performed were reviewed for outcomes and complications.

RESULTS

The study group included 14 patients (7 female, age range of 7 to 18 years, average 13 years). Image guided procedures included vascular stent (n=1), coil embolization (n=4), urinoma drainage catheter (n=4), ureteral stent (n=4) and nephrostomy tube (n=8). Renal salvage was successful in 11 (79%) cases. In 3 patients who underwent nephrectomy, one patient had continued severe urinary extravasation, one had a preexisting ureteropelvic junction obstruction and poor renal function and one was for failure to retrieve a fractured guide wire.

CONCLUSION

We found that the utilization of interventional radiology procedures were able to salvage most kidneys with high-grade injuries where conservative management failed.

CLINICAL RELEVANCE/APPLICATION

Whenever possible, in stable patients who fail conservative management for high-grade blunt renal trauma, interventional radiology should be the first line of management for renal salvage.

CL-PDS-TH4B • Percutaneous Radiofrequency Ablation for Children with Small Lung Metastases

Frederic Deschamps (Presenter) ; Geoffroy Farouil ; Laure Saumet ; Jean-Louis Bourguain ; Laurence Brugieres ; Jeanne Muret ; Thierry J De Baere MD *

PURPOSE

Although percutaneous radiofrequency ablation (RFA) has been proven safe and effective for small lung metastases (LM), thoracotomy remains the gold standard for cancer children.

METHOD AND MATERIALS

We prospectively analyzed all the children referred for RFA of LM in our Institute. Indications and feasibility were discussed at multidisciplinary meetings. The goal was to treat all the LM using RFA in order to avoid thoracotomy. All the procedures were performed under general anesthesia by an interventional radiologist under CT guidance. If LM were bilateral, two procedures were performed. The follow-up included a chest CT at 1 month and then, every 3 months. We noted the patients' details (gender, age, primary tumor and number of previous thoracotomy(ies)) and metastases' characteristics (number, bilateral, size, treatability by RFA), the procedure details (duration, number of LM treated per procedure, complication rate, duration of hospital stay), the rate of complete treatment per LM and the occurrence of new LM.

RESULTS

8 patients (5 males, 3 females, mean=10 years old, 3.3 to 15.5) suffering from osteosarcoma (n=5), hepatoblastoma (n=2) and Ewing sarcoma (n=1) were referred for RFA of 33 LM between October 2011 and February 2013. Seven patients had previous surgical resection of LM (mean previous thoracotomies= 2.1, 1 to 5). The LM were bilateral in 3 patients. The mean diameter was 5 mm (2 to 12). One LM was contraindicated for RFA because it was too close to the hilum and was referred for surgical resection. Thirty-two LM were successfully treated in 10 procedures (mean LM treated per procedure= 3, 1 to 7). We experienced 4 pneumothoraxes, including 2 that required chest tube drainage. The patients didn't experience any pain or dyspnea. The mean hospital stay was 3 days after the procedure (1 to 8). After a median follow-up of 255 days (42 to 380), the complete treatment was 100% per LM and no new LM occurred.

CONCLUSION

RFA is a safe and effective for children with small lung metastases

CLINICAL RELEVANCE/APPLICATION

Rfa is an alternative to thoracotomy, even in children, and must be taken into account in the management of small -and potentially iterative- lung metastases.

CL-PDS-TH5B • Simplifying Pediatric Size-Specific Dose Estimate: Relationship between Body Weight and Body Diameter in Pediatric CT

Ranish D Khawaja MBBS, MD (Presenter) ; Beth Vettiyil MBBS ; Sarabjeet Singh MD ; Sarvenaz Pourjabbar MD ; Atul Padole MD ; Mannudeep K Kalra MD * ; Diego A Lira MD ; Ruth Lim MD * ; Randheer Shailam MD ; Katherine Nimkin MD ; Michael S Gee MD, PhD ; Pallavi Sagar MBBS ; Sjirk J Westra MD

PURPOSE

The size-specific dose estimate (SSDE) requires manual measurement of diameters (AP: anteroposterior; LAT: lateral and E: effective) for individual patients on their CT images on different axes, which is tedious and complex in clinical settings. The objective of our study was to determine if child's body weight (BW) can be used as a surrogate for measuring patient diameter in pediatric settings.

METHOD AND MATERIALS

AP and LAT body diameters were measured at mid-slice level in 522 (mean age: 12.7±6.8 years; M:F 294:228) consecutive pediatric chest and abdomen CT exams (=18years). The study was IRB-approved, HIPAA-compliant. BW was grouped into 5 subgroups (in Kg), W₁: 0-9 (n=20); W₂: 10-26 (n=102); W₃: 27-45 (n=93); W₄: 46-100 (n=292) and W₅: >101 (n=15). Effective diameter (E₁) was calculated as the square root of the product of AP and LAT. Effective diameter (E₂) was also obtained at mid-slice level from an automatic software. Correlation coefficients were calculated between BW and body measurements (AP, LAT, E₁ and E₂) across: **(a) BW subgroups (b) age subgroups (c) patient sex, and (d) overall.** P-value of 0.001 with 99.9% confidence interval was considered significant.

RESULTS

Mean BW was 51.2±26.4 Kg (range: 3-145 Kg). Mean AP, LAT, E₁ and E₂ were 207.1±50.8mm, 289.8±72.6mm, and 243.3±62.0mm and 233.6±55.4mm, respectively. BW had a strong correlation with AP, LAT, E₁ and E₂ diameters and BW (0.88, 0.85, 0.86 and 0.93 respectively; all p < 1 overestimated the manually measured E₂ by 4%, there was a strong correlation (r=0.92). Correlation for effective diameter was similar for girls and boys (0.80 vs 0.77). The highest correlation value was reported for children weighing 0-9 Kg (0.82, p < 0.001).

Body weight correlates strongly with AP, LAT, and effective body diameters (E₁ and E₂) in our cohort of pediatric CT exams. Body weight, instead of body diameter, can be used to predict size-specific dose in children, and make it clinically simple.

CLINICAL RELEVANCE/APPLICATION

Body weight correlates strongly with all body measurements in pediatric patients. This finding was significantly stronger of lightweight (< 10Kg).

CL-PDE-TH6B • Imaging of Pediatric Carcinoid Tumors: A Pictorial and Clinical Review

Shannon L Tocchio MD (Presenter) ; Kevin Ching MD ; Sameh Tadros MD, MSc

PURPOSE/AIM

Carcinoid tumors are extremely rare in the pediatric population and are usually discovered unexpectedly after appendectomy. These slow-growing neuroendocrine tumors even more rarely present in the respiratory and genitourinary systems. Our exhibit aims to illustrate the spectrum of pediatric carcinoid tumors in common and atypical organ systems using multiple imaging modalities.

CONTENT ORGANIZATION

1. Overview and epidemiology of pediatric carcinoid tumors. 2. Signs, symptoms, and clinical presentation. 3. Imaging findings of local and advanced endobronchial, gastrointestinal, and testicular carcinoid tumors evaluated with advanced imaging modalities including CT, MRI, PET and ultrasound. 4. Brief review of treatment, recommendations for follow-up imaging, and multi-disciplinary care.

SUMMARY

Major teaching points include: 1. Pediatric carcinoid tumors are extremely rare and most commonly involve the gastrointestinal tract. 2. Gastrointestinal, endobronchial, and testicular carcinoid tumors should be included in the differential diagnosis in the setting of specific imaging findings and anatomic locations. 3. Diagnostic and follow-up imaging for carcinoid tumors using non-ionizing imaging modalities is an important consideration in the pediatric population.

Case-based Review of Neuroradiology: Head and Neck (An Interactive Session)

Thursday, 01:30 PM - 03:00 PM • S100AB



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MSCN53 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Pina C Sanelli, MD

MSCN53A • Adult Head and Neck

Laurie A Loevner MD (Presenter)

LEARNING OBJECTIVES

1) Emphasize pertinent anatomy in the adult neck as it pertains to image interpretation through well selected cases. 2) Generate succinct, well thought out differential diagnoses for a spectrum of head and neck lesions. 3) Identify important imaging findings that allow the radiologist to be specific about establishing 'the' diagnosis. 4) Avoid the common adult radiologic diagnostic pitfalls.

ABSTRACT

This session will evaluate a spectrum of pathologies encountered in the adult head and neck. The session will emphasize critical analysis of image findings which allow the radiologist to generate a succinct, short differential diagnosis, and in many instances, the correct diagnosis. There will be emphasis on correct anatomic localization of pathology in the head and neck, patterns of radiologic pathology, as well as management decisions that may include additional imaging studies, or clinical interventional.

MSCN53B • Pediatric Head and Neck

Nafi Aygun MD (Presenter)

LEARNING OBJECTIVES

1) Provide a short differential diagnosis for neck tumors in children in varying ages. 2) Recognize various congenital anomalies in the neck. 3) Manage neck emergencies effectively.

ABSTRACT

A review of various developmental, infectious and neoplastic conditions in the neck and skull base in children will be provided with a case-based approach with emphasis on key imaging findings that help in differential diagnosis.

MSCN53C • Common Misdiagnoses

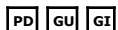
Hugh D Curtin MD (Presenter)

LEARNING OBJECTIVES

1) Identify the most common areas where abnormalities are overlooked and will be able to identify subtle abnormalities at those locations. 2) Identify areas to search for additional diagnoses that must not be overlooked once a primary diagnosis is established.

Case-based Review of Pediatric Radiology: Pediatric Abdominal Imaging (An Interactive Session)

Thursday, 01:30 PM - 03:00 PM • S406A



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MSCP53 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Edward Y Lee, MD, MPH

MSCP53A • Congenital and Acquired Abdominal Masses in Pediatric Patients

Bernard F Laya DO (Presenter)

LEARNING OBJECTIVES

1) Discuss a systematic approach in the imaging evaluation of abdominal masses in children. 2) Review the typical imaging appearance of selected congenital and acquired abdominal masses in the pediatric population. 3) Discuss pitfalls in the diagnostic imaging of abdominal masses in children.

MSCP53B • Abdominal Vascular Anomalies and Abnormalities in Children

Arnold C Merrow MD (Presenter) *

LEARNING OBJECTIVES

1) Discuss the basic classification scheme of pediatric vascular anomalies, including vascular neoplasms and congenital vascular malformations. 2) Review helpful clinical features and imaging findings of vascular anomalies in children. 3) Discuss other abnormalities of pediatric abdominal vessels, including thrombosis, stenosis, and aneurysms.

ABSTRACT

MSCP53C • Abdominal Trauma in Children

Peter J Strouse MD (Presenter)

LEARNING OBJECTIVES

1) Describe mechanisms of abdominal trauma in children. 2) Discuss proper imaging algorithms for pediatric trauma patients. 3) Identify optimal CT protocols for abdominal trauma in pediatric patients. 4) Describe imaging findings in pediatric abdominal trauma.

ABSTRACT

The etiology of abdominal trauma in children includes, but is not limited to motor vehicle collisions, bicycle collisions, falls, sports injury and assault (child abuse). Although ultrasound may play a role in quick evaluation of the unstable patient for intraperitoneal hemorrhage, computed tomography (CT) remains the chief mode of evaluation of the hemodynamically stable child with suspected abdominal injury. CT for abdominal trauma is performed with intravenous contrast, but without an oral contrast preparation. Use of a multi-detector CT with very thin source images allows for near isotropic images with high quality sagittal and coronal reformatted images. 3D images, including dedicated pelvic reformats for pelvic fracture, are readily created. Systematic review of abdominal CTs performed for trauma increases sensitivity. Injuries to the liver, spleen, kidneys, pancreas and adrenal glands may occur. Severity of injury and/or the identification of active extravasation may alter management. Injuries to the gastrointestinal tract are uncommon, but may bear significant morbidity if not properly diagnosed. While free intraperitoneal gas may be seen with bowel injury, it is not uniformly seen and may rarely be caused by an alternative etiology. Children are more prone than adults to hypoperfusion complex. Gut hypoperfusion complex may be an indicator of tenuous patient stability. Injuries to the renal collecting system and bladder are rare, but when present require specific treatment. Diaphragm injury is rare. Large vessel vascular injury due to blunt abdominal trauma is uncommon in children, but may occur. Careful review of a trauma CT is not complete without a careful review of bone window images for skeletal fracture. Seatbelt injuries are more common in children than adults. Seatbelt injuries produce predictable but varied injuries to multiple structures. Younger children and infants may be the victim of child abuse. With child abuse, injury to any organ may occur.

Case-based Review of Pediatric Radiology: Pediatric Pelvis Imaging (An Interactive Session)

Thursday, 03:30 PM - 05:00 PM • S406A

PD GU GI

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MSCP54 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Edward Y Lee, MD, MPH

MSCP54A • Congenital and Acquired Scrotal Lesions in Children

Angelisa M Paladin MD (Presenter)

LEARNING OBJECTIVES

1) Review helpful clinical aspects and imaging characteristics of congenital and acquired scrotal lesions in children. 2) Learn characteristic imaging findings to narrow the differential of scrotal tumors.

MSCP54B • Adnexal Masses in Pediatric Patients

Mary R Wyers MD (Presenter)

LEARNING OBJECTIVES

1) Discuss imaging modality choices for evaluating the pediatric female pelvis. 2) Review characteristic imaging findings of adnexal masses in children and discuss differential diagnoses of various lesions which will be presented. 3) Discuss work up and management of adnexal masses in children.

MSCP54C • Bowel Disorders in Pediatric Population

Michael S Gee MD, PhD (Presenter)

LEARNING OBJECTIVES

1) Review the pathophysiology and characteristic imaging features of pediatric bowel disorders. 2) Discuss the pros and cons of different imaging modalities for evaluating bowel disorders in young patients.

ASRT@RSNA 2013: Improving Practice in Pediatric Skeletal Radiography

Thursday, 03:40 PM - 04:40 PM • N230

PD MK

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MRS56 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Maryann Hardy, MSc, PhD

LEARNING OBJECTIVES

1) Understand the main features of skeletal growth and development in childhood. 2) Understand how skeletal growth and development can result in predictable pathological appearances on radiographs that may inform image acquisition techniques. 3) Appreciate how normal variations in the juvenile skeleton can mask or mimic common pathologies and influence the interpretation of radiographic images. 4) Examine, through the use of case studies, the appropriateness of diagnostic radiography image acquisition techniques and image quality assessment criteria.

ABSTRACT

Children are an important patient group accounting for an estimated 20% of imaging examinations. Many published papers and authors have stated that imaging children requires a unique set of skills and knowledge as children are not little adults. Much of this literature explores psychosocial development in children, communication and interaction. However, radiographers working with children also need to have a good understanding of anatomical growth and development to improve image acquisition techniques and appreciation of the distinctive radiographic appearances associated with the juvenile skeleton. Using case studies from clinical practice, this presentation will explore how knowledge of skeletal development during childhood can prevent the misapplication of image acquisition techniques and quality assessment criteria and the misinterpretation of normal developmental variations.

Pediatric Neuroimaging II

Thursday, 04:30 PM - 06:00 PM • S102AB

PD MR NR

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RC713 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC713A • MRI Imaging of Brain Development

Robert C McKinstry MD, PhD (Presenter) *

LEARNING OBJECTIVES

1) Describe how water and myelin content influence the T1 and T2 relaxation times. 2) Describe the time course and regional variation of brain maturational changes. 3) Use a systematic approach to determine the child's brain age.

RC713B • Congenital Brain Malformations

Sarah S Milla MD (Presenter)

LEARNING OBJECTIVES

1) Understanding the classification of congenital brain malformations, particularly cortical malformations. 2) Comprehension of the genetic undertones of congenital brain malformations. 3) Ability to identify imaging appearance of common cortical malformations on brain MR imaging.

Chest/Cardiovascular Imaging II

Friday, 08:30 AM - 10:00 AM • N229



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RC813 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC813A • Pitfalls and Errors in Pediatric Thoracic Imaging

George A Taylor MD (Presenter)

LEARNING OBJECTIVES

1) Understand the common sources of error in pediatric thoracic imaging. 2) Demonstrate understanding of the influence of biases on the diagnostic process. 3) Analyze image viewing techniques and apply them to strategies for improving image interpretation.

ABSTRACT

The goal of this presentation is to describe common patterns and potential etiologies of diagnostic error in pediatric thoracic imaging identified over a 13-year experience at a large academic children's hospital. Errors are defined as a diagnosis that was delayed, wrong or missed; they are classified as perceptual, cognitive, system-related or unavoidable. Perceptual errors were the most common type of error, defined as a diagnostic finding that is noticeable but missed. Cognitive contributors to perceptual errors will be discussed, including the role of search satisfaction, visual distractors, and visual isolation. Cognitive errors were defined as faulty information processing, related to overinterpretation of an imaging finding, misinterpretation of a finding or failure to consider a different diagnosis for a given finding [premature closure]; faulty data gathering (poorly performed imaging examination, inadequate review of patient history or lack of consideration of a patient's underlying condition), or insufficient knowledge base. The presentation will also discuss a number of cognitive biases that subconsciously affect our ability to effectively reach the right diagnosis. These will include examples of availability heuristics (memory of a similar case), framing effect (how data are presented), the anchoring heuristic (premature closure), the reluctance to confront authority (blind obedience), and reader overconfidence. Finally, we will review organizational errors in which systems issues such as faulty medical history and inefficient processes contribute to diagnostic errors in the chest. The presentation will suggest strategies for systematic and individual improvement.

RC813B • Back to Basics: Radiography of the Pediatric Chest

Robert H Cleveland MD (Presenter) *

LEARNING OBJECTIVES

1) Review strategies to improve diagnostic accuracy in interpreting chest radiographs. 2) Enhance confidence for NOT obtaining follow-up CT. 3) Increase appreciation of when follow-up CT is needed.

ABSTRACT

In this session, we will review the role of the chest x-ray (CXR) in the era of high tech imaging. Specifically the need to re-establish a sense of confidence in interpreting CXR will be addressed. Situations where a confident interpretation of the CXR obviates the need for CT will be stressed as well as those where the CXR clearly requires CT follow-up. The need to "image gently", following ALARA, guidelines is now widely accepted in pediatric radiology and is growing in acceptance in adult imaging. In our department (Boston Children's Hospital) this has led to a 24% decrease in CT volume between 2006 and 2010. This in turn, means that a need for an increased nuanced approach to interpreting CXR is required. Specific recommendations to increase the accuracy in interpreting CXR will be discussed. As the indications for a high percentage of CXR in pediatric patients are nonspecific, the need to constantly be vigilant regarding unexpected and uncommon conditions will be stressed. Particular attention will be paid to the broad range of conditions related to wheezing (or noisy breathing) and dyspnea including airway obstruction and interstitial lung disease. The increasing incidence of complications in pediatric community acquired pneumonia and the appropriate role of CXR in that situation will also be discussed.

RC813C • Advanced Imaging of the Pediatric Chest

Mantosh S Rattan MD (Presenter)

LEARNING OBJECTIVES

1) Introduce the ChILD (Children's Interstitial Lung Disease) Research Cooperative classification for pediatric diffuse lung disease. 2) Discuss imaging techniques in children with diffuse lung disease. 3) Review imaging features of specific disorders in the ChILD spectrum.

Pediatric Neurosonography Update: Head, Spine, and Transcranial Doppler Ultrasound (How-to Workshop)

Friday, 08:30 AM - 10:00 AM • E261



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RC851 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

M. Beth McCarville, MD *
Geetika Khanna, MD,MS
Kristin A Fickenschier, MD

LEARNING OBJECTIVES

1) Describe advances in neurosonography that can be applied on a local level to improve daily practice of neonatal neurosonography. 2) Review indications for neonatal spine sonography, identify normal variants/pitfalls that can simulate disease, and recognize the sonographic features of spinal anomalies. 3) Review the role of transcranial Doppler ultrasound with imaging (duplex) and without imaging (non-duplex), in assigning stroke risk to children with sickle cell disease.

ABSTRACT

URL's

<http://www.umkcradres.org/education/peds/neuro/index.htm>

**SST13 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5****Moderator**
Anne Marie Cahill, MBCh
Moderator
Kamlesh U Kukreja, MD ***SST13-01 • Long-term Outcome of Percutaneous Interventions of Hepatic Venous Outflow Obstruction after Pediatric Living Donor Liver Transplantation****Minoru Yabuta** MD (Presenter) ; **Toshiya Shibata** MD ; **Ken Shinozuka** ; **Toyomichi Shibata** MD ; **Hiroyoshi Isoda** MD ; **Kaori Togashi** MD, PhD ***PURPOSE**

To evaluate retrospectively the long-term outcome of percutaneous interventions of hepatic venous outflow obstruction (HVOO) after pediatric living donor liver transplantation (LDLT).

METHOD AND MATERIALS

Between October 1997 and December 2012, 48 patients (24 male, 24 female; median age, 6 years) who had undergone LDLT were confirmed to have HVOO at percutaneous hepatic venography and manometry, and underwent percutaneous interventions, including balloon angioplasty with / without stent placement. Technical success, patency rates, stent placement and major complications were evaluated.

RESULTS

Technical success was achieved in 92 of 93 sessions (99.0%). During follow-up periods ranged from one to 182 months (median, 51.5 months), 28 patients were treated with a single session of balloon angioplasty and 20 who developed recurrent stenosis were treated with repeated balloon angioplasty or stent placement. The rate of primary, primary assisted, and secondary patency at 1-, 3-, 5-, 10-years after the initial balloon angioplasty were 0.64, 0.57, 0.57 and 0.52 respectively, 0.98, 0.95, 0.95 and 0.95 respectively, and 1.0, 1.0, 1.0 and 1.0 respectively. A major complication was seen in a session of a patient, where a stent was migrated to the right atrium.

CONCLUSION

Balloon angioplasty with / without stent placement was an effective treatment for HVOO after LDLT.

CLINICAL RELEVANCE/APPLICATION

Percutaneous interventions such as balloon dilation and stent placement were effective in patients with HVOO after LDLT.

SST13-02 • The Influence of Liver and Spleen Volume Changes after Percutaneous Transhepatic Angioplasty for Portal Venous Stenosis in Pediatric Living-donor Liver Transplant Recipients**Manabu Nakata** MD (Presenter) ; **Waka Nakata** MD ; **Hideharu Sugimoto** MD**PURPOSE**

To quantify the changes in liver and spleen volumes after percutaneous transhepatic angioplasty (PTA) for portal venous stenosis (PVS) occurring in patients after pediatric living-donor liver transplantation.

METHOD AND MATERIALS

Twenty consecutive patients (8 males, 12 females; mean age 4.8 years) who underwent PTA for PVS from August 2005 to September 2011 after pediatric liver transplantation were included. Liver and spleen volumes (LV, SV) were quantified using computed tomography (CT) before PTA, 3 months, 12 months, 24 months, and 36 months after PTA. Spleen volume-to-standard spleen volume ratio (SV/SSV) and LV/SV were calculated at each time point. Statistical analyses of comparison between pre- and postoperative data were performed. The correlation of LV and SV at each time point was analyzed.

RESULTS

LV significantly increased by an average of 28% within 6 months after PTA and remained increased significantly through 36 months. SV/SSV significantly decreased an average of 24% within 6 months and remained decreased significantly through 36 months, although SV had no significant difference between pre- and post-operative data. LV/SV significantly increased by an average of 36% within 6 months after PTA, and thereafter had no significant differences. SV at each follow-up time point significantly negatively correlated with LV.

CONCLUSION

Improvement of splenomegaly and liver enlargement occur and continue during 36 months after PTA, with negative correlations between liver and spleen volumes. These data indicate that liver and spleen volumes are influenced by portal venous flow and recovery of these volumes may take at least 36 months.

CLINICAL RELEVANCE/APPLICATION

Splenomegaly is improved within 6 months after PTA, although the decrease in spleen volume may continue at least 36 months. This information may be utilized for application and evaluation of PTA.

SST13-03 • Non-invasive Measures that Guide Indication, Pathology and Outcome of Percutaneous Biliary Intervention in Paediatric Transplantation**Anushka Lijutikov** MBBS, FRCR (Presenter) ; **Navaratne Subhachandra** MBBS, FRCR ; **Pauline A Kane** MBBS, FRCR ; **John B Karani** MBBS, FRCR ; **Maria E Sellars** MD, FRCR ; **Anil Dhawan** MD, FRCPC ; **Nigel Heaton****PURPOSE**

Biliary complications adversely impact on graft survival following transplantation in paediatric recipients. Interventions are technically challenging and carry risk in infants and children; therefore, selection is critical. The purpose of this study was to evaluate the diagnostic utility of non-invasive parameters which singularly, or in combination, guide the need for intervention.

METHOD AND MATERIALS

Reference to pre-procedural non-invasive imaging and graft function from the transplant database between 2008 -2012 formed the study cohort. This retrospective study reviewed these parameters in predicting findings, pathology and outcome of intervention.

RESULTS

There were 49 interventions in 40 recipients (ages 4 months-16 years, M:F 21:19) transplanted between 1997-2012. (Total transplant cohort 582). Indications included EHBA, PFIC, ALF. Operative technique was left lateral segment (37) including live related (22) and whole grafts (3). Key findings were non-cholestatic enzyme rise (34), increasing duct calibre on ultrasound (34), MRCP diagnosis of anastomotic strictures (27) and cholangiopathy (7). Diagnostic PTC was successful in all with findings of anastomotic strictures (24), cholangiopathy (7), bile leaks (4). Balloon dilatation of strictures was successful in 20. External biliary drains were placed in 4. The positive predictive values (PPV) in diagnosing anastomotic stricture and cholangiopathy are non-cholestatic enzyme rise 70.3% and 34.6%, USS duct calibre 63% and 30%, MRCP 78% and 43 %. The combined tests PPVs are 85% and 55.5%.

CONCLUSION

The combination of non-invasive measures of graft assessment allows most appropriate selection for biliary intervention in paediatric liver transplant recipients but MRCP is the best single predictor of biliary complications

CLINICAL RELEVANCE/APPLICATION

Biliary complications adversely affect graft survival in paediatric recipients. Interventions are technically challenging and carry risk hence selection of the correct patient is crucial

SST13-04 • Pediatric Soft Tissue Tumors: Deterministic Factors for Safety and Accuracy of Diagnostic Yield in Image-guided Percutaneous Core-needle Biopsies

Michael R Acord MD (Presenter) ; Raja Shaikh MD ; Gulraiz A Chaudry MBChB

PURPOSE

To assess lesion-related and technical factors that affect diagnostic yield and safety in image-guided percutaneous core-needle biopsies (PCNB) of soft tissue tumors in children.

METHOD AND MATERIALS

Institutional review board approval was obtained for a retrospective study of 150 PCNB performed at our institution from January 2003 to January 2013. Medical records and radiologic data were evaluated on all PCNB performed on soft tissue lesions, excluding vascular malformations. Technical details of the procedure, demographic characteristics of the patients, and radiologic features of the lesions such as the location, size, imaging nature and enhancement were recorded. Procedure-related complications and repeat PCNB or other testing due to poor or non-diagnostic yields were noted. Associations between the radiologic characteristics of the lesion, technical factors and diagnostic yield were evaluated using bivariate and multivariate logistic regression.

RESULTS

Mean patient age was 11.4 ± 7.1 years. Ultrasound guidance was used in 80% of cases. General anesthesia was the most common form of sedation (86% of cases). Mean number of core biopsies was 6.4 ± 3.2 per case. The overall diagnostic yield was 80%. On bivariate analysis, procedures taking less number of cores (OR 0.75 95% CI 0.57 to 0.99, $p=0.04$) and involving benign lesions (OR 0.14 94% CI 0.03 to 0.69, $p=0.02$) were associated with non-diagnostic biopsies. Using a lower gauge needle showed a trend toward improving diagnostic success (OR 1.87 95% CI 0.93 to 3.71, $p=0.08$). On multivariate analysis, the only factor that predicted low diagnostic yield was whether the lesion was benign (OR 0.14 95% CI 0.02 to 1.00, $p=0.05$).

CONCLUSION

Image guided PCNB is a safe and accurate method for the diagnosis of pediatric soft tissue tumors. Particular attention should be paid toward lesions that appear benign on pre-procedure imaging in order to improve diagnostic yield.

CLINICAL RELEVANCE/APPLICATION

Percutaneous core needle biopsy of soft tissue tumors is a minimally invasive technique compared to open biopsy and has a low complication rate providing an early diagnosis.

SST13-05 • Pilot Study Evaluating Parenchymal Perfusion and Renal Blood Flow Using Color-coded Imaging in Pediatric Renal Artery Angioplasty

Tiffany Hwang (Presenter) * ; Erin Girard PhD * ; Anne Marie Cahill MBBSCh

PURPOSE

syngo iFlow is a color-coded imaging adjunct used to interpret digital subtraction angiography (DSA). This study investigates the ability of *syngo* iFlow to evaluate changes in flow and parenchymal perfusion in patients undergoing angioplasty for renal artery stenosis (RAS).

METHOD AND MATERIALS

20 children underwent 30 percutaneous angioplasty procedures for RAS. For each stenotic artery that underwent angioplasty, pre-and post-stenotic regions of interest (ROI) were chosen. The difference in time to peak (dTTP) maximum contrast opacification values (given by iFlow) between these 2 ROIs represented flow rate across the stenosis. ROIs were drawn in the relevant parenchymal pole (upper, middle, and/or lower) to assess perfusion. 44 poles from the 20 patients were assessed for time to peak (TTP) opacity values. Only 35 of these poles had sufficient data to compute inflow rate, measured by the slope of the linear regression of contrast opacification vs time, representing contrast values between 15-75% of maximum opacity.

RESULTS

iFlow measured significantly improved flow across stenosis following angioplasty as indicated by dTTP ($p=0.0001$). dTTP decreased in 23/30 cases, of which 12 demonstrated dTTP=0 seconds post-angioplasty, possibly due to complete flow restoration. No change in dTTP was demonstrated in 5/30 cases. dTTP increased in 2/30 cases, correlating with mural dissection and intraluminal thrombus. iFlow measured significantly improved perfusion following angioplasty as indicated by TTP ($p=.0008$). TTP decreased in 31/44 poles, indicating an improvement in flow. No change in TTP was seen in 6/44 poles. An increase in TTP was demonstrated in 7/44 poles, 3 of which correlated with dissection and thrombus. Using inflow slope as a second measure, iFlow demonstrated improved perfusion in 20/35 poles, but this was not significant ($p>0.05$).

CONCLUSION

This pilot study demonstrates the ability of iFlow to quantitatively and significantly assess differences in parenchymal perfusion and flow rates across stenotic vessels following angioplasty procedures. Thus, iFlow in general may provide the physician with more objective evidence of improved vascular flow and perfusion in other vascular interventions.

CLINICAL RELEVANCE/APPLICATION

The ability of iFlow to quantify vascular parameters can provide the physician with objective measurements of altered vascular flow during angioplasty procedures and can guide the interventional plan.

SST13-06 • Implementation of a Fluoroscopy Competency Check-off for Radiology Trainees: Impact on Reducing Radiation Dose in the Pediatric Population

Sweta Shah (Presenter) ; Stephane Desouches DO ; Lisa H Lowe MD ; Brenton D Reading MD

PURPOSE

The purpose of this study is to determine the impact of implementing a fluoroscopy competency check-off aimed at decreasing radiation dose in three common pediatric fluoroscopic studies.

METHOD AND MATERIALS

A fluoroscopy competency check-off form was developed for PGY 2-6 radiology trainees performing pediatric procedures. Techniques used to limit radiation exposure for three common pediatric radiologic studies were discussed. Additionally, a pediatric radiologist supervised and assessed each trainee's competency and technical skill prior to independent performance of the three procedures. Radiation dose and exposure time were recorded for 171 oropharyngeal motility (OPM), 176 voiding cystourethrogram (VCUG), and 171 upper GI (UGI) exams in 24 trainees for the six months preceding implementation of the competency check-off and in 114 OPM, 145 VCUG, and 132 UGI exams in 23 trainees for the six months after implementation. A paired t-test was then used to compare the mean radiation dose for each procedure in the two groups.

RESULTS

A statistically significant reduction in radiation dose was found for OPM and VCUG exams after competency implementation. The mean

radiation dose of the OPM exam decreased from 7.75 to 5.33 mGy pre- and post- competency implementation respectively, with a total reduction of 31% ($P = 0.023$). The mean radiation dose of the VCUg exam decreased from 3.90 to 2.59 mGy pre- and post- competency implementation respectively, with a total reduction of 33% ($P = 0.033$). No statistically significant reduction was seen for the UGI exam.

CONCLUSION

Implementation of a fluoroscopy competency check-off for radiology trainees reduced radiation dose in pediatric patients undergoing both OPM and VCUg studies.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates that exposing trainees to a competency check-off can help decrease the radiation dose, thereby reducing the risk of excess radiation exposure in the pediatric population.

SST13-07 • A System for Real-time Mapping of Pediatric Skin Dose during Fluoroscopic Cardiac Procedures

Daniel Bednarek PhD (Presenter) * ; **Vijay Rana** * ; **Stephen Rudin** PhD *

PURPOSE

To provide the clinician with a real-time visual graphic display showing the distribution of skin-dose for pediatric patients undergoing fluoroscopic cardiac interventional procedures.

METHOD AND MATERIALS

We have developed a software system to track skin dose during fluoroscopic interventional procedures and to provide a graphic representation of the cumulative dose distribution in real time. Originally the program and graphics were developed and verified for adult patients. To use the system with pediatric patients, an open-source software application was used to create a series of 3D patient graphic models with varying heights ranging from 60 to 128 cm and with three weight ranges for each height. The model most closely matching the patient is selected at the beginning of the procedure and the skin dose is calculated at each point on the graphic within the x-ray beam for each exposure pulse and the cumulative distribution is displayed in a color-coded mapping. To verify that the correct dose is calculated, measurements were made with a 6 cc ionization chamber placed on the surface of a pediatric phantom (Kyoto Kagaku PBU-70, 105 cm height, 20 kg weight) at various locations on the torso; exposures were made for a range of projections with the heart at C-arm gantry iso-center and chamber readings were compared with those of the tracking system. Similar measurements were made with a water-filled phantom of similar dimensions.

RESULTS

Using a matching patient graphic, the ratio of dose tracking system reading to ionization chamber reading had an average value of 1.08 +/- 0.04 for fluoroscopy and 0.99 +/- 0.05 for DA mode with the pediatric phantom, while the values agreed with the chamber within 2% for the water phantom over a range of cardiac RAO/LAO and CRA/CAU projections.

CONCLUSION

With the newly developed patient graphic models, accurate tracking of skin dose is possible in real-time during pediatric fluoroscopic interventional procedures, enabling the clinician to reposition the C-arm to avoid exceeding the threshold for deterministic skin effects.

CLINICAL RELEVANCE/APPLICATION

The system developed facilitates the management of risk for deterministic skin effects for pediatric patients during interventional fluoroscopic procedures.

SST13-08 • MRI of Vascular Anomalies: Value of Diffusion Imaging

Sebastien Benali MD (Presenter) ; **Josee Dubois** MD ; **Francoise F Rypens** MD ; **Chantale Lapierre** MD ; **Gilles P Soulez** MD *

PURPOSE

MRI diffusion-weighted imaging (DWI) is a new method to evaluate the diffusion of intra and extracellular water. The goal of this study is to characterize diffusion imaging parameters in vascular anomalies (VA) and compare them to malignant soft tissue tumors.

METHOD AND MATERIALS

RESULTS

The mean ADC values at $b=1000-500$ were estimated at 3.05 ± 0.08 , 3.37 ± 0.24 and 3.01 ± 0.09 respectively for VM, LM and hemangiomas and at 2.96 ± 0.08 for soft tissue tumors. At $b=1000-500$, ADC values were significantly higher for LM as compared to VM ($p=0.01$) and hemangiomas ($p=0.03$). However, no significant difference could be demonstrated between VM, hemangiomas and soft tissue tumors. At $b=1000$, ADC values were estimated at 3.82 ± 0.14 , 4.23 ± 0.18 and 3.74 ± 0.15 respectively for VM, LM and hemangiomas and at 3.46 ± 0.11 for soft tissue tumors. The latter displayed significantly lower ADC values than VM and LM ($p=0.0001$) and hemangiomas ($p=0.02$). No significant correlation between contrast enhancement and ADC values was observed ($r=-0.056$).

CONCLUSION

All VA presented high ADC values. At $b=1000-500$, LM displayed significantly higher values as compared to VM and hemangiomas. At $b=1000$, malignant soft tissue tumors showed significantly lower ADC values than VM, LM and hemangiomas. DWI could be a useful tool to characterize VA and discriminate them from malignant lesions.

CLINICAL RELEVANCE/APPLICATION

Diffusion imaging can characterize and differentiate vascular anomalies from soft tissue malignant tumors. Soft tissue malignant tumors display higher ADC coefficient than brain and organ tumors.

SST13-09 • Novel Use of MRI/X-ray Overlay for Interventional Radiology Sclerotherapy Procedures in the Pediatric Population

Tiffany Hwang (Presenter) * ; **Erin Girard** PhD * ; **Anne Marie Cahill** MBCh

PURPOSE

Fluoroscopic imaging is used for navigation during lesion-targeting interventional radiology procedures, such as sclerotherapy for vascular malformations, as it provides real-time information. However, fluoroscopy provides only a 2D image of 3D anatomy and does not visualize the lesion. On the other hand, magnetic resonance imaging (MRI) provides quality soft tissue contrast for lesion visualization. *syngo* 3D/3D fusion and iPilot dynamic software programs (Siemens Healthcare AG, Forchheim, Germany) allow 3D MR images to be overlaid on real-time fluoroscopy images, enhancing lesion visualization during interventional procedures. This study describes our experience using this software to target lesions and compares procedure and fluoroscopy times between software assisted and unassisted cases.

METHOD AND MATERIALS

20 children, mean age 11.5 years, underwent sclerotherapy procedures with MRI/x-ray image overlay assistance for vascular malformations. Their average procedure and fluoroscopy times were compared to those of 100 software-unassisted sclerotherapy procedures using a 2-tailed t-test (p

RESULTS

Both average procedure and fluoroscopic times of software-assisted cases (47.11; 4.97 min) were higher than those of unassisted cases (42.54; 4.72 min), but not to a statistically significant degree ($p=0.37$; 0.84). The physician reported that MRI overlay increased therapeutic confidence in 17/20 cases and determined the interventional plan in 10/20 cases. Of these 10 cases, changes made included adding a clarifying ultrasound (1), not performing a post-procedural DynaCT (2), determining post-procedural extubation (3), or a combination of these changes (3). The 3/20 cases that did not confer useful knowledge occurred with diffuse vascular malformations, where MR overlay was suboptimal due to unclear lesion boundaries.

CONCLUSION

In this study we showed that MRI/x-ray overlay during sclerotherapy can confer additional information to improve treatment confidence and guide the interventional plan while not significantly increasing procedure or fluoroscopy time.

CLINICAL RELEVANCE/APPLICATION

MRI/x-ray overlay during sclerotherapy procedures may improve clinical care by providing physicians with additional information on the distribution of sclerotherapy agent, with respect to a prior MRI.

Disclosure Index

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