

Emergency Radiology

Diagnostic Limits, Blindspots and Pitfalls in CT Imaging of Blunt Abdominal Trauma

All Day Location: ER Community, Learning Center

Participants

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David Machado-Aranda, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To emphasize the critical role of multidetector CT in identifying injuries in the polytrauma patient
2. To discuss the diagnostic limitations, potential blindspots and pitfalls of MDCT in imaging blunt abdominal trauma
3. To reinforce the understanding of these concepts through the use of illustrative cases and quiz questions

TABLE OF CONTENTS/OUTLINE

MDCT studies from a 10-year search of the radiology information system of our quaternary care, academic teaching hospital with a Level 1 trauma center were reviewed for the contents of this exhibit. With unparalleled diagnostic performance, MDCT plays a critical role in imaging injuries sustained from blunt abdominal trauma for expediting clinical/surgical treatment to improve clinical outcomes. But MDCT is not perfect, with known diagnostic limits for imaging injuries to the diaphragm, pancreas, bowel and mesentery, ureters and bladder, and thoracolumbar spine. These, along with potential blindspots and imaging pitfalls, will be discussed. Concepts will be reinforced with illustrative cases and quiz questions. An awareness of the "dark side" of MDCT in blunt abdominal trauma is crucial for the trauma radiologist to reduce the likelihood of missed findings.

Advantages of a State-of-the-Art Dual Source Computed Tomography (DSCT) System in an ED Setting

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

Advantages of DSCT in the ED with high pitch and dual energy modes of operation. Benefits of DSCT to minimize radiation dose.

TABLE OF CONTENTS/OUTLINE

Objective of this presentation is to explain technical and applications advancements of a DSCT (Siemens Somatom Definition Force) and advantages in an ED. DSCT technical description Configuration High pitch Dual energy Teaching Point: DSCT can improve axial sampling as compared to single source CT. Table speeds up to 737 mm/s, temporal resolution up to 66 ms and pitches > 3 can be achieved. Clinical Examples DSCT high pitch mode obtained free-breathing without gating to reduce scan time Non-cooperative patient Pediatrics Involuntary motion DSCT dual energy mode for functional and quantitative imaging Iodine lung perfusion Teaching Point: Perfusion images offer valuable additional information in the diagnosis of pulmonary embolism eliminating the need for repeat or additional imaging. Radiation Safety Hardware Z-axis collimators Detectors and electronics for improved efficiency Iterative reconstruction Acquisition kV and mA modulation Shuttle mode Lower kV Teaching Point: Effective mAs=pitch/mAs. The mAs compensates for a higher pitch to maintain image quality and does not result in dose savings.

The Emergent Aorta: Multi-modality Imaging Review in an Emergent Setting for Emergency Department Clinicians and Junior Radiology Residents "Cannot Miss Lesions"

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

Traumatic Aortic Injuries are relatively common in the setting of the emergency department. Prompt diagnosis is essential for prompt management and can be lifesaving in multiple instances. Radiology plays an integral role in diagnosis of this injury, in particular junior residence in the emergency department. Therefore, familiarity with the imaging appearance of the normal aortic anatomy, normal variants, and emergencies is essential to all emergency department personal. This exhibit aims to provide a thorough review of the aorta and its acute/chronic with potential acute component with target audience of junior residence early in their call experience and for emergency department faculty and residents. Anatomy of the aorta, its branches, and normal variants on CTA, MRA, and angiogram Through review of acute aortic pathologies with emphasis on differentiating between act now and watch lesions

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Introduction of normal aorta and its branches anatomy on CTA/MRA and angiogram Multi-modality imaging review of normal variants that could present potential diagnostic uncertainty. Detailed chart summarizing the main acute aortic injuries including pathophysiology/mechanism of injury and multi-modality imaging findings with classification into act now/watch lesion Imaging case review of multiple acute aortic pathologies

Post-mortem CT Angiography (PMCTA): Potential Benefits in Forensic Practice

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

SUMMARY Although the use of PMCT (post-mortem CT) is being increased primarily to guide subsequent forensic dissection, recently, PMCT angiography (PMCTA) has been introduced to provide more detailed information concerning the vascular structures. We herein describe the PMCTA findings with the special emphasis on the potential roles of PMCTA in forensic medicine.

TEACHING POINTS

1. Vascular injury. PMCTA allows the detailed and objective assessment of important vascular structures in the postoperative and traumatic condition which would otherwise be extremely difficult and time consuming using standard autopsy dissection.
2. Natural cardiac death: PMCT cannot define the hemodynamic significance of the identified vascular stenosis especially in natural cardiovascular death. This is the same as with autopsy findings. However, evaluation of organ perfusion with PMCTA may be useful in estimating the functional relevance of the vascular lesion in selected cases, providing more confident diagnosis of ischemia as a cause of death.

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1. Technical background
2. PMCTA acquisition
3. Review of cases
- A. Trauma - Detection and precise localization of vascular injury
- B. Natural cardiac death - More confident diagnosis of ischemia
4. Discussion

Blunt Diaphragmatic Lesions: Imaging Findings and Possible Pitfalls

All Day Location: ER Community, Learning Center

Participants

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Giampietro Bonatti, Bolzano, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

-Blunt diaphragmatic lesions (BDL) may occur in up to 7% of major traumas and are often associated with other abdominal and/or thoracic injuries.-FAST and chest X-ray may rise the suspicion of BDL. -Multidetector-row CT (MDCT) is able to clearly depict, in the majority of the cases, the presence of BDL; anyway, radiologists in an emergency setting often overlook them, mainly because of the presence of distracting lesions to other organs.-Delayed diagnosis of BDL represents a relatively common event and is associated with increased morbidity and mortality rates.-Coronal and sagittal multiplanar reconstruction images (2-3 mm thick) are the most useful for detecting BDL.

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1. Review of epidemiology, trauma dynamics and pathogenesis of blunt diaphragmatic lesions.2. Review of FAST signs and anomalies associated with BDL.3. Review of chest X-ray signs associated with BDL.4. Review of MDCT signs of BDL, highlighting the ones that are more difficult to appreciate.5. Examples of false negative cases of BDL (slight diaphragmatic alterations with no viscera herniation, mechanical ventilation,...).6. Examples of false positive cases of BDL (relaxatio).

Code Stroke! Not Everything that Restricts Diffusions is Acute Ischemia

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

To review the basic physics and evaluation of diffusion weighted imaging To review the typical findings of acute ischemia including cause of restricted diffusion, morphology and location, contributory MR findings and evolution To review the differential diagnoses for intracranial lesions that demonstrate restricted diffusion and imaging pearls for differentiation

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Basic physics of diffusion weighted imaging Identifying restricted diffusion Why we see restricted diffusion in acute ischemia Imaging appearance of acute and evolving ischemia Differential diagnosis of intracranial restricted diffusion, image findings and differentiating from acute ischemia Ischemic Arterial Venous Inflammatory/Infectious Abscess Empyema Encephalitis Granulomatous Creutzfeldt-Jakob Disease Neoplastic Glioma Meningioma Lymphoma Metastatic Disease Demyelinating Hemorrhage Epidermoid Cyst Diffuse Axonal Injury

Near Death Imaging: Understanding the Radiologic Predictors of Cause, Cost, and Course unto Death

All Day Location: ER Community, Learning Center

Awards**Certificate of Merit****Participants**

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TEACHING POINTS

Medical autopsies provide critical information on evolution of disease and cause of death. Combined with postmortem CT and MR, autopsy studies can help establish cause of death. With these postmortem exams as ground truth, antemortem, or near death imaging (NDI) can assist in identifying imaging predictors of mortality that can potentially change management for better outcome. We use our experience to highlight the following teaching points: Define the concept of NDI (imaging studies at terminal hospital visit or admission) and analyze patients with antemortem and postmortem imaging studies to identify early predictors of the final cause of death based on autopsy results. Illustrate evolution of disease processes associated with high mortality based on antemortem and postmortem imaging and pathology findings. Discuss the role of NDI and provide possible changes in patient management that could potentially prevent mortality.

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Discuss NDI concept and its role as mortality predictor and identify useful signs on imaging. Case based review of different causes of death with ante-mortem and post-mortem imaging, with correlation of admission diagnosis, hospital course and causes of death. All cases have autopsy correlation. Briefly discuss predictive models and outcomes research addressing this breach in mortality.

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Subba R. Digumarthy, MD - 2013 Honored Educator

Abdominal and Pelvic Trauma: Misses and Misinterpretations on Multidetector Computed Tomography

All Day Location: ER Community, Learning Center

Awards**Certificate of Merit****Identified for RadioGraphics****Participants**Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to DiscloseSavvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AGChristine O. Menias, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to DiscloseSanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to DiscloseNataly Farshait, MS, Toronto, ON (*Abstract Co-Author*) Nothing to DiscloseDouglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose**TEACHING POINTS**

To illustrate common diagnostic errors in the interpretation of abdominal and pelvic Multidetector Computed Tomography (MDCT) in trauma patients. To analyze the factors leading to these mistakes. To discuss the potential advantages of utilizing multiple phases of imaging and multiplanar reconstructions (MPRs) for the accurate detection and characterization of traumatic injuries.

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Multiple abnormalities are frequently encountered on the initial MDCT examinations of critically ill trauma patients. Such traumatic findings can be easily overlooked due to numerous concomitant injuries. MDCT abdominal and pelvic imaging findings of the following missed abnormalities will be illustrated and reviewed: penetrating diaphragmatic injury; penetrating and blunt bowel injury; blunt pancreatic injury; gallbladder hematoma; penetrating and blunt adrenal injury; renal vascular injury; blunt ureteral injury; bladder rupture. The value of multiphasic MDCT techniques, MPRs, intraluminal contrast in selected cases, follow-up imaging examinations using a multimodality approach and management options will all be discussed and demonstrated. This exhibit offers an opportunity to review common mistakes in the evaluation of abdominal and pelvic MDCT trauma scans and emphasizes the solutions to avoid the misinterpretation of these life-threatening entities.

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Christine O. Menias, MD - 2013 Honored Educator

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Sanjeev Bhalla, MD - 2014 Honored Educator

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Imaging Scrotal Pathology in the Emergency Department - Beyond Testicular Torsion

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

1. Learn an appropriate standardized sonographic technique for evaluating the acute scrotum. 2. Discuss relevant differential diagnoses pertaining to the emergency department patient. 3. Review typical sonographic and CT/MRI findings for each pathology.

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1. Anatomy of the scrotum and testicle
2. Standard sonographic approach using grayscale, color spectral Doppler, and cine techniques
3. Differential diagnosis in the emergency department patient - Trauma - testicular rupture, contusion, hematocele - Vascular - testicular torsion, infarct, parenchymal edema - Infection - necrotizing fasciitis, epididymo-orchitis, cellulitis/abscess - Mass/tumor - benign and malignant neoplasms, intestinal hernia - Incidental, normal variant - cystic dilatation of rete testis, varicocele, intratesticular adrenal rests
4. For each disease category, review typical sonographic and CT/MRI findings with selected gross pathology or histology correlation

"In the Crossfire!" A Comprehensive Pictorial Review of Gunshot Wounds to the Genitourinary System: Kidney, Ureter, Bladder, Urethra, Scrotum, and Penis

All Day Location: ER Community, Learning Center

Participants

Mahyar Ghanaat, MD, Brooklyn, AL (*Presenter*) Nothing to Disclose

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TEACHING POINTS

1. Approximately 6% of penetrating abdominopelvic gunshot injuries affect the kidneys. 2. Grading of renal injuries (AAST system) requires detection of subcapsular and perinephric hematomas, size of laceration, collecting system injury, and vascular injury. 3. Repeat CT may be necessary to diagnose delayed hemorrhage. Correlation angiography depicts pseudoaneurysms, which may be occult on initial CT. 4. Delayed excretory phase is essential in diagnosing collecting system or ureteral injury. 5. CT cystogram and sentinel clot signs aid detection of bladder injury. 6. Retrograde urethrography is the test of choice in evaluating urethral injury. Antegrade urethrography may be performed in patients with a suprapubic catheter. 7. Hyperechoic scrotal air should not be confused with microlithiasis. 8. MPR and slab techniques may enhance detection of extravasation from scrotal arteries on CT.

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- Chart will be shown and examples from all AAST Grades I-V renal injury including subcategories of contusion, hematoma, laceration, and vascular subcategories will be studied.
- Ureteral leaks will be shown on CT.
- Intraperitoneal, extraperitoneal, and mixed bladder ruptures will be shown.
- Retrograde urethrograms of urethral injury due to bullets will be studied.
- US and CT of scrotum and CT of penile injuries will be shown and reviewed.

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Douglas S. Katz, MD - 2013 Honored Educator

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Viable versus Nonviable? Review of Newer Terminologies and Criteria in a First Trimester ER Sonogram

All Day Location: ER Community, Learning Center

Participants

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Joseph Ifokwe, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Describe recent sonographic terminologies and guidelines including IUP of uncertain viability, and pregnancy of unknown location in vaginal bleeding in the first trimester. 2. Review newer diagnostic sonographic criteria for nonviability. 3. Discuss the incidence and predictability of classic signs in normal viable intrauterine pregnancies.

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CONTENTS: 1. State the newer guidelines and sonographic criteria in patients with first trimester bleeding. 2. Exemplify entities including terms such as pregnancy failure, suspicious of pregnancy failure, IUP of uncertain viability, and pregnancy of unknown location. 3. Review recent changes in sonographic criteria for nonviability. The diagnosis and management of vaginal bleeding in early pregnancy has drastically changed with the availability of transvaginal sonography and quantitative Beta human chorionic gonadotrophin (Bhcg) measurements. Newer sonographic criteria to establish viability as well as the terminologies of IUP of uncertain viability and pregnancy of unknown location help to make a diagnosis in the presence of a positive serum Bhcg. Understanding the newer terminologies is extremely critical to patient management in the Emergency Room to determine the lines of treatment. This will avoid the administration of methotrexate inadvertently in patients with a normal IUP.

Look Again! How Well Do You Detect Vascular Pathology on Unenhanced CT?

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

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Oleg Teytelboym, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

1. Many important vascular findings can be detected on unenhanced CT studies, yet radiologists often overlook vessels on unenhanced exams
2. Adapting a simple systematic search pattern can help radiologists miss fewer arterial and venous abnormalities on unenhanced CT

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-Goals This exhibit aims to:

- Highlight a simple yet comprehensive search pattern to help radiologists identify vascular pathology on unenhanced CT
- Review the spectrum of important vascular findings on unenhanced CT through a fun, interactive, case-based quiz

-Search pattern overview

- Arteries (big > small); Veins (big > small)
- Assess vessel size, contour, and density; look for surrounding fat stranding
- Interactive case-based quiz

- Arteries-Intramural hematoma-Aneurysm-Pseudoaneurysm-Dissection-Thrombosis-Vasculitis
- Veins-Thrombosis-Obstruction-Compression syndromes
- Anatomic variants-Bonus cases for fun

-Summary

Patients can present with a host of important, albeit unsuspected, vascular abnormalities on unenhanced CT exams. As such, radiologists should be familiar with these entities and interrogate vessels systematically on every study.

Mountain Biking Injuries: Musculoskeletal Trauma of the Neck, Torso and Extremities

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

To describe the epidemiology of mountain biking injuries. To illustrate types and mechanisms of musculoskeletal injuries of the neck, torso and extremities sustained by mountain bikers. To highlight the importance of multimodality imaging, including radiography, CT, MRI and ultrasound, in clinical management.

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1. Epidemiology of mountain biking injuries. 2. Pictorial review of musculoskeletal injuries sustained by mountain bikers, including illustration of each pathology and explanation of mechanisms of each injury. Neck: cervical spine fracture; cervical nerve root injury Upper extremities: shoulder labral tear; avulsion fracture of the greater tuberosity of the humerus; Chauffeur fracture; nightstick fracture; scaphoid fracture; foreign body; Paget-Schroetter disease Thorax: clavicular fracture; pneumothorax; scapular fracture; rib fracture Pelvis: ischial bursitis; lumbar spine fracture; myositis ossificans; gluteal tear; cyclist's nodule Hip and lower extremities: hip labral tear; acetabular fracture; adductor magnus tear; hamstring tear; Morel-Lavallée lesion of the thigh and knee; patellar fracture; osteochondral defect of patella 3. Role of multimodality imaging for treatment decisions and conclusion.

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Ali Guermazi, MD, PhD - 2012 Honored Educator

Avulsion Injuries: Tip of the Iceberg - Review of Common Avulsion Injuries and Associated Underlying 'Hidden' Soft Tissues Injuries

All Day Location: ER Community, Learning Center

Participants

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Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

Bharti Khurana, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Avulsion injuries are frequently seen on radiographs in the emergency room. These usually represent detachment of a bone fragment at the attachment site of ligament, tendon or joint capsule that could possibly render the entire joint unstable and result in deformity. It is prudent for the emergency radiologist to recognize these "tiny" and seemingly innocent injuries as tip of the iceberg and direct the referring clinician on the clinical implications of such injuries.

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1. Describe most common and critical avulsion injuries encountered in the Emergency Department and their imaging appearance on plain radiographs and corresponding cross sectional imaging MRI or CT. 2. Discuss the underlying anatomy, biomechanics, ligamentous or soft tissue injuries associated with these avulsion injuries on MRI with case examples. 3. Briefly discuss appropriate management. 4. Review "don't miss" avulsion injuries.

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

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MRI Appearance of Common Emergency Room Renal Pathologies

All Day Location: ER Community, Learning Center

Participants

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TEACHING POINTS

To illustrate potential advantages in utilizing magnetic resonance imaging (MRI) for the diagnosis of acute renal pathologies, with emphasis on characteristic MRI features of pyelonephritis, renal abscess, and obstructive nephropathy through case examples. Describe specific imaging characteristics of each renal pathology on different sequences. Emphasis will be given to specific MRI features helpful in distinguishing one diagnosis from another.

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Technical considerations for a rapid MRI protocol, optimized for imaging in the emergency setting, will be outlined. Overview of normal kidney appearance on MRI. Overview of pyelonephritis on MRI. The selected pyelonephritis cases have been confirmed by blood and urine culture growing a matching bacterium. Overview of renal abscesses on MRI. The abscesses shown on the select cases were subsequently drained by CT guided technique with confirmed culture result. Overview of obstructive renal nephropathy on MRI. Summary: Recent advances in Body MRI allow rapid imaging in emergency setting. Familiarization with MRI features of common renal pathologies frequently encountered from ED, especially for an early form of disease, would be instrumental in providing accurate diagnosis and improving patient care.

Imaging Correlation: Multiphasic Multidetector TC compared with Angiographic and Surgical Findings in Active Gastrointestinal Bleeding

All Day Location: ER Community, Learning Center

Participants

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Roberto Correa Soto, Salamanca, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To gain awareness that acute gastrointestinal and abdominal wall active bleeding are a common reason for emergency admissions and an important cause of morbidity and mortality. 2. To learn that multidetector computed tomographic (CT) angiography has gained acceptance as a first-line option for the diagnosis and management of gastrointestinal tract, CT angiography also provides accurate information about the presence or absence of active bleeding, its source, and its cause. 3. Demonstrate correlation between multiphasic CT (3 phases: non enhanced, arterial phase and venous phase) and angiographic contrast extravasation during embolization, macroscopic bleeding during surgery or endoscopic procedures. 4. Experience from reviewing 104 confirmed cases in our institution, when clinical context was present, will be used to emphasize the diagnostic role of multiphase MDCT.

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Introduction Clinical Manifestations Initial Diagnostic Evaluation Multidetector CT Angiography -Imaging Technique -Findings of acute gastrointestinal and abdominal wall bleeding - Acute bleeding: Blush - Recent bleeding - Causes of bleeding - Imaging Pitfalls Our institution's experience Conclusions

MDCT and MR Imaging of Abdominal Manifestations of Hematological Conditions

All Day Location: ER Community, Learning Center

Awards

Cum Laude

Participants

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 Anil K. Dasyam, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
 Christine O. Menias, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Outline the Etiology and classification of varied hematologic conditions causing abdominal manifestations. 2. Discuss and illustrate the varied and typical abdominal imaging manifestations of hematologic conditions and their differential

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HEMOGLOBINOPATHIES AND ANEMIA• Sickle cell anemia DISORDERS OF COAGULATION• Bleeding disorders/tendencies Hemophilia Ruptured mass Spontaneous bleeding HELLP syndrome Complication from Pancreatitis Complications from anticoagulant therapy such as bilateral adrenal hemorrhage, suburothelial hemorrhage B. Disorders of Hypercoagulability Thromboembolic disease Hepatic veno-occlusive disease Paroxysmal nocturnal hemoglobinuria Venous thrombosis such as from Nephrotic syndrome or postpartum ovarian vein thrombosis DISORDERS OF IRON OVERLOAD• Primary Hemochromatosis• Secondary hemochromatosis and Hemosiderosis INFECTIONS• Epstein Barr Infection• AIDS NEOPLASMS• Lymphoproliferative disorders• Leukemia• Tumors of endothelial origin SUMMARY: Each have varied abdominal imaging manifestations, some have non-specific findings, some have typical findings and multiple organs may be affected at the same time. Combination of the findings may help narrow the differential and management is ultimately guided by the etiology.

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Venkata S. Katabathina, MD - 2012 Honored Educator
 Christine O. Menias, MD - 2013 Honored Educator
 Christine O. Menias, MD - 2014 Honored Educator
 Christine O. Menias, MD - 2015 Honored Educator

Pediatric Abdominal Sonography in the ED: Not the Usual Suspects

All Day Location: ER Community, Learning Center

Participants

Melissa P. Smith, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose

Kari R. Wilson, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose

M. Elizabeth Oates, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose

Barbara K. Pawley, MD, Louisville, KY (*Presenter*) Nothing to Disclose

TEACHING POINTS

Emergency radiologists encounter relatively few pediatric cross-sectional imaging examinations in daily practice. There is growing interest in using ultrasound (gray-scale, color Doppler) in the pediatric age group in whom ionizing radiation from CT is undesirable; while MRI is increasingly available, it often requires sedation. Using an interactive quiz format, this education exhibit showcases a variety of incidental abdominal conditions diagnosed by sonography. Nine diagnoses are presented. Sonographic images are correlated with companion CT and/or MRI to underscore the potential role of ultrasound as a primary diagnostic modality in children presenting to the ED. With practice, emergency radiologists can learn to make an expedient and confident diagnosis of a variety of pediatric abdominal conditions by sonography, precluding the need for other imaging modalities, decreasing the time to diagnosis, and eliminating the use of ionizing radiation.

TABLE OF CONTENTS/OUTLINE

The list of nine cases is organized in four categories: Hepatobiliary: Caroli syndrome, Choledochal cyst; GI tract: Meckel's diverticulum/pneumatosis, Familial adenomatous polyposis, Ileocecal intussusception; GU system: Autosomal recessive polycystic kidney disease, Inguinal hernia containing uterus and ovaries; Neoplasms: Burkitt lymphoma, Myofibroblastic tumor

Diagnosis and Management of Abdominal Visceral Arterial Pseudoaneurysms?What the Radiologist Needs to Know

All Day Location: ER Community, Learning Center

Participants

Norifumi Hosaka, MD, Shinagawa-Ku, Japan (*Presenter*) Nothing to Disclose
 Takehiko Gokan, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Jiro Munechika, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Rei Kobayashi, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Sinya Ikeda, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Syouei Sai, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Yoshimitsu Ohgiya, MD, Shinagawa-ku, Japan (*Abstract Co-Author*) Nothing to Disclose
 Hiroto Sasamori, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Noritaka Seino, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit Abdominal visceral arterial pseudoaneurysms are rare but the diagnosis is clinically important because of the associated high mortality and potential complications. Detailed evaluation is crucial because the treatment depends on the location, type, and size of the aneurysm as well as the medical condition. In this exhibit, we provide a practical review of clinical manifestations, causes, and MDCT features of splanchnic pseudoaneurysm. We also review and discuss management of this condition with emphasis on interventional procedure.

TABLE OF CONTENTS/OUTLINE

Content organizationThe cases will be presented in a quiz format. Key diagnostic points, pitfalls, and therapeutic management will be highlighted in the discussion of each case.1 Clinical manifestation including shock, hemorrhage, fever etc.2 Cause including pancreatitis, trauma, iatrogenic origin, neoplasm etc.3 MDCT diagnosis with discussion of usefulness of 3D CT angiography.4 Pitfalls of MDCT diagnosis5 Management and treatment with emphasis on endovascular therapyConclusionThe major teaching points of this exhibit areTo understand clinical manifestations, causes, and MDCT features of abdominal visceral arterial pseudoaneurysmsTo understand that MDCT will provide useful information for planning the interventional therapy

Imaging Manifestations of Complications to Optical Colonoscopy

All Day Location: ER Community, Learning Center

Participants

Ryan L. Webb, MD, Staten Island, NY (*Presenter*) Nothing to Disclose

Steven Peti, MD, Staten Island, NY (*Abstract Co-Author*) Nothing to Disclose

Ami Gokli, MD, Staten Island, NY (*Abstract Co-Author*) Nothing to Disclose

Douglas G. Walled, MD, Staten Island, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:1. To discuss the role of the radiologist in the post-colonoscopy evaluation.2. To illustrate the various complications of optical colonoscopy. 3. To review postpolypectomy electrocoagulation syndrome and its diagnosis.

TABLE OF CONTENTS/OUTLINE

IntroductionPerforationHemorrhage Solid organ injuryPostpolypectomy SyndromeSummary

Bowel Injury in Blunt Abdominal Trauma: Evaluation with CT and Clinical Implications in Surgically Proven Cases

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

David D. Bates, MD, Boston, MA (*Presenter*) Nothing to Disclose

Michael Wasserman, MD, Natick, MA (*Abstract Co-Author*) Nothing to Disclose

Varun Gorantla, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review the direct and indirect imaging findings of bowel injury in blunt abdominal trauma. 2. Discuss the role of CT to appropriately diagnose bowel injury in blunt abdominal trauma, including review of current literature as well as pearls and pitfalls 3. Discuss the clinical implications of making a timely and correct diagnosis

TABLE OF CONTENTS/OUTLINE

1. Review the epidemiology and mechanism of bowel injury in blunt abdominal trauma 2. Review elements of the clinical history and when to suspect bowel injury 3. Direct and indirect signs of bowel injury in blunt trauma and when to recommend follow-up imaging 4. Review of the current literature on imaging and bowel injury in blunt abdominal trauma 5. Sample cases highlighting the importance of maintaining a high degree of suspicion and timely diagnosis in the setting of blunt abdominal trauma 6. Clinical management implications and the role of the radiologist

Multidetector CT Angiography in Cranio-Facial Trauma

All Day Location: ER Community, Learning Center

Participants

Vijay S. Pande, MD, Memphis, TN (*Presenter*) Nothing to Disclose
Richard I. Gray, MD, Bartlett, TN (*Abstract Co-Author*) Nothing to Disclose
Sridhar S. Shankar, MD, MBA, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose
Geoffrey S. Goodin, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose
Vijetha V. Maller, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose
Rafal M. Kedzierski, MD, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Afzal Omer, MD, Memphis, IN (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Indications of CT angiography in blunt craniofacial trauma.2) Identification and types of traumatic cerebrovascular injuries.3) Therapeutic implications of CTA in patients with traumatic cerebrovascular injuries.

TABLE OF CONTENTS/OUTLINE

1) Technique of Multidetector CT angiography in setting of trauma.2) Mechanism and common locations of cerebrovascular injuries.3) CT angiographic appearances of vascular injury.4) Clinical impact of cerebrovascular injuries.

The Long Bone: Imaging of Femoral Trauma

All Day Location: ER Community, Learning Center

Participants

Meir H. Scheinfeld, MD, PhD, Bronx, NY (*Presenter*) Nothing to Disclose

Andrew Friedman, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

Robert J. Dym, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Displacement and to a lesser extent orientation of proximal femoral fractures determines prognosis and the surgical approach to repair. Femoral shaft fractures may be due to major trauma, but minimal trauma may cause fractures in patients being treated with bisphosphonates. Distal Femoral fractures may be classified using the AO classification, which divides fractures into extra-articular, partial-articular and complete articular fractures.

TABLE OF CONTENTS/OUTLINE

Imaging considerations for the proximal femur Frontal Frog-leg lateral Cross-table lateral Pipkin classification of femoral head fractures associated with posterior hip dislocation Femoral neck fractures Subcapital Transcervical Basicervical Intertrochanteric Garden classification of subcapital femoral neck fractures Methods of femoral neck fracture repair Isolated trochanter fractures Greater trochanter Lesser trochanter Femoral shaft fractures High energy trauma Atypical (bisphosphonate related) sub-trochanteric fracture Distal Femur Fractures (AO classification) Extra-articular Partial-articular Complete articular

Dictatorship in a State of Emergency: Dictating and Reporting Results to the Emergency Department

All Day Location: ER Community, Learning Center

Participants

Meir H. Scheinfeld, MD, PhD, Bronx, NY (*Presenter*) Nothing to Disclose

Robert J. Dym, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

Shlomit Goldberg-Stein, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

- Need to be concise, clear, and timely in the ED setting.
- Limitations of the radiology study should establish realistic expectations of the diagnostic capability of the study.
- Structured reports and templates make omissions less likely and allow easier readability by clinicians.
- Impressions should be short, list most important items first, give short and long term recommendations for follow up and most importantly answer, or attempt to answer, the clinical question.
- Verbal communication and subsequent documentation is essential for urgent and unexpected results, important follow up recommendations, and changes in preliminary interpretations.

TABLE OF CONTENTS/OUTLINE

What is the Radiology report? Goals of the Emergency Radiology Report: Timeliness Conciseness Clarity Specificity Accuracy Who are the Consumers of the Emergency Radiology Report? Primary: ED clinician Secondary: Specialists consulting in the ED, Inpatient physicians, Outpatient primary care physicians and specialists Tertiary: Patient, Radiology coder- Report Components History and Indication Technique Comparisons Limitations Findings Impression Vignettes will be provided for ideal and sub-optimal reporting components Direct (Verbal) Communication Summary of Key Points References

Rib Trauma: A Review of Rib Fractures, Common Mimics, and Complications

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Brett S. Talbot, MD, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose

Christopher P. Gange JR, MMedSc, MD, Rochester, NY (*Presenter*) Nothing to Disclose

Abhishek Chaturvedi, MD, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

This exhibit will: Review anatomy of ribs and altered physiology of breathing when fractured. Review the spectrum of congenital variants and diseases affecting the ribs which need to be separately identified from traumatic injury. Identify the different patterns of rib injuries: buckle, non-displaced, displaced, segmental fractures including costochondral injuries. Identify key complications of rib injuries

TABLE OF CONTENTS/OUTLINE

Rib anatomy review Congenital variants and non-traumatic conditions that need to be recognized Patterns of rib injuries Buckle fractures Non-displaced Displaced Segmental fractures Pathological fractures Complications of rib injuries Chest wall hematoma Pneumothorax Pulmonary contusion Pulmonary laceration Active extravasation How to localize

Breast Imaging for the Emergency Room Radiologist: An Educational Review

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Elizabeth V. Geffen, MD, New York, NY (*Presenter*) Nothing to Disclose

Linda Moy, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Review breast pathology often encountered in the emergency setting. 2) Recognize the imaging features of breast emergencies on the modalities most commonly utilized in the emergency department (CT, Xray, and US). 3) Discuss the differential diagnosis, management, and follow-up of these entities.

TABLE OF CONTENTS/OUTLINE

TABLE OF CONTENTS: 1) Trauma: a) seatbelt injury b) ruptured breast implant c) penetrating trauma / 2) Infection: a) mastitis (puerperal and nonpuerperal) b) abscess / 3) Inflammation: a) idiopathic granulomatous mastitis / 4) Iatrogenic: a) retained needle localization wire b) migration of biopsy clip c) pseudoaneurysm d) hematoma with prolonged bleeding. OUTLINE: In this review, we will use cases from our institution to feature a variety of breast specific emergencies including traumatic, infectious, inflammatory and iatrogenic etiologies. Our cases highlight the imaging characteristics of breast disease on the modalities most commonly encountered in the emergency setting - ultrasound, radiographs, and CAT Scan - in order to familiarize the emergency radiologist with the full spectrum of imaging appearances. We will also discuss the follow-up algorithms of acute breast disease, which should be provided to the patient in order to ensure continuity of care and facilitate timely disease management.

Foreign Body on the Lateral Neck Radiograph: Are You Sure? Pitfalls in Interpretation

All Day Location: ER Community, Learning Center

Awards

Cum Laude

Identified for RadioGraphics

Participants

Alba Castan Senar, MD, Zaragoza, Spain (*Presenter*) Nothing to Disclose
 Ylenia Navarro, MD, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose
 Raquel Larrosa, MD, Tudela, Spain (*Abstract Co-Author*) Nothing to Disclose
 Yonathan Taboada, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose
 Alfonso Romeo, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose
 Elena Angulo Hervias, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose
 Jose Maria Artigas, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Identify and learn imaging findings of ingested foreign bodies of upper aerodigestive tract in lateral neck radiograph. Illustrate spectrum of pitfalls in the diagnosis of aerodigestive tract foreign bodies. Frequently laryngeal cartilages with their variable pattern of ossification create a diagnostic problem for the radiologist.

TABLE OF CONTENTS/OUTLINE

1. We show lateral neck radiographs in a quiz format: including cases of real and mimicking foreign bodies. 2. Review of anatomical structures that can mimic foreign bodies in lateral neck radiograph. Key differential diagnostic points. Long styloid process / calcified stylohyoid ligament Cricoid cartilage: the ossified superior margin of the cricoid lamina and vertical ossification of the posterior margin of the cricoid lamina The ossified superior cornua of the thyroid cartilage The ossified triticeous cartilage in the lateral thyrohyoid ligament The ossified arytenoids Prevertebral ossification 3. Pharyngoesophageal foreign bodies: Epidemiology Common locations of impaction: Cricopharyngeal region is the most frequent Complications: retropharyngeal abscesses, esophageal perforation, mediastinitis, tracheoesophageal fistula Posteroanterior and lateral neck and chest radiographs: Indications and imaging features Management: Diagnostic and therapeutic algorithm

Traumatic Aortic Injury After Blunt Chest Trauma: Lessons from a Level One Trauma Center

All Day Location: ER Community, Learning Center

Participants

Guillermo P. Sangster, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Robby Rahim, MD, Shreveport, LA (*Presenter*) Nothing to Disclose

Jared R. Garrett, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Thomas R. Gates, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Scott C. Adams, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Carlos H. Previgliano, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Ibrahim Alshahrouri, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Recognize MDCT imaging patterns in patients with TAI following blunt chest trauma. 2. Validate the advantages of MDCT for the screening of stable patients suspected of having a TAI. 3. Identify MDCT mimics to avoid unnecessary invasive procedures.

TABLE OF CONTENTS/OUTLINE

Injuries of the aorta have catastrophic consequences if untreated. Timely accurate diagnosis of traumatic aortic injuries (TAI) is essential for life saving repair. Multidetector Computed Tomography (MDCT) of the chest has become the standard screening imaging technique for TAI diagnosis. Images from patients in our Level I trauma center database were retrospectively analyzed and compared with surgical and pathologic findings. Content organization: -Mechanisms of traumatic aortic injury are reviewed and the gamut of TAI patterns is depicted. -MDCT imaging patterns of TAI are correlated with angiography before and after surgical or endovascular repair when applicable. -Illustrations of mimics that may delay treatment or lead to unnecessary surgical intervention are shown.

Thoraco-lumbar Spine Trauma CT: How Not to Miss a Fracture? - "A Radiology Resident's Guide"

All Day Location: ER Community, Learning Center

Participants

Sameer B. Raniga, FRCR, MD, Muscat, Oman (*Abstract Co-Author*) Nothing to Disclose
 Anand Kirwadi, MBBS, Sheffield, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
 Venugopal Menon, MD, MChir, Muscat, Oman (*Abstract Co-Author*) Nothing to Disclose
 Sajid H. Butt, MBBS, FRCR, Stanmore, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
 Al-Azri Faisal, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
 Matthew R. Skalski, DC, Whittier, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. A simplified and systematic approach to the CT interpretation of the Thoraco-lumbar spine Trauma using a "CT Spine Trauma checklist". 2. Efficient and rapid interpretation of Thoraco-lumbar spine CT studies for a general and emergency radiologist. 3. To formulate a surgically relevant radiological report without using any particular qualitative or quantitative classification.

TABLE OF CONTENTS/OUTLINE

1. MDCT Technique and reconstruction in spine Trauma 2. Review the surgically relevant spine anatomy using surgeon's language 3. Systematic Simplified interpretation of spine Trauma CT- "Checklist" 4. Five fracture patterns are described- (1) Fracture-dislocation (2) flexion-distraction (3) Burst (4) flexion compression and (5) Others. 5. CT characteristics, pearls and pitfalls of each of the five categories of fractures with emphasis on management are explained. 6. Pictorial review of usefulness of the simplified approach is emphasized. 7. MDCT pearls and pitfalls in differentiating 'Look alike' lesions with different surgical implications are stressed. **Summary:** This exhibit will be a primer for the radiology residents in the rapid and accurate systematic interpretation of the Thoraco-lumbar trauma spine CT. That will enable them to effectively communicate the CT findings as well as formulating the surgically relevant radiology report.

CT Pulmonary Angiography in Pulmonary Embolism- "A Survival Guide" for Radiology Residents

All Day Location: ER Community, Learning Center

Awards**Certificate of Merit****Participants**

Sameer B. Raniga, FRCR, MD, Muscat, Oman (*Presenter*) Nothing to Disclose
Narainder Gupta, MD, Bryn Mawr, PA (*Abstract Co-Author*) Nothing to Disclose
Rashid AISukaiti, MD, Muscat, Oman (*Abstract Co-Author*) Nothing to Disclose
Bhavin Jankharia, MD, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose
Matthew R. Skalski, DC, Whittier, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. A simplified and systematic approach to the interpretation of the CT Pulmonary Angiography [CTPA] in a suspected acute pulmonary embolism [PE] 2. Efficient and rapid interpretation of CTPA examination and to formulate a clinically relevant report. 3. Technical and diagnostic pearls- pitfalls of the CTPA using illustrative examples.

TABLE OF CONTENTS/OUTLINE

Diagnostic algorithm in suspected Acute PE with emphasis on the role of CTPA MDCT Technique- Pearls and pitfalls Technical Adequacy of CTPA examination Stratification of CTPA studies into- Good, average and suboptimal examination. Systematic Simplified interpretation of CTPA CTPA signs of Acute PE- Direct and Indirect Signs Stratification of CTPA examination into- Negative and Positive studies for PE. CTPA- Diagnostic pitfalls and alternative diagnosis CTPA based risk stratification: Clot burden and Right ventricular strain Understanding the current concepts in the management of the PE Role of CTPA in Management decisions

Bariatric Surgery Gone Bad: Imaging of Emergency Patients with Complications Related to Bariatric Surgery

All Day Location: ER Community, Learning Center

Participants

Laura L. Avery, MD, Boston, MA (*Presenter*) Nothing to Disclose

Parul Penkar, MBBS, Needham Heights, MA (*Abstract Co-Author*) Nothing to Disclose

Hani H. Abujudeh, MD, MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review the expected anatomical changes related to surgery. 2. Recognize various complications of bariatric surgery. 2. Develop an algorithm for analyzing CT scans for subtle signs of internal hernia.

TABLE OF CONTENTS/OUTLINE

An imaging approach to Emergency Department patients with suspected complications related to bariatric procedures most commonly roux-en-y gastric bypass. Surgical anatomy will be reviewed. Optimal imaging protocols will be addressed. Case based format: Imaging appearance and algorithmic approach to internal hernias Transmesocolic hernia Petersen retro roux limb hernia (multiple cases will be presented to ensure future recognition of this important hernia type) Additional Complications: Ulcer formation/pouchitis Intussusceptions at the jejunal-jejunal anastomosis pancreatic biliary limb obstruction SMA syndrome Complications related to non-bypass bariatric procedures: Gastric band slippage Gastric Balloon migration Gastric Sleeve dehiscence

Imaging the Vasculopath : Acute Complications of Chronic Vascular Conditions

All Day Location: ER Community, Learning Center

Participants

Ryan A. Beighton, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose

Christine O. Menias, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose

Sailen G. Naidu, MD, Phoenix, AZ (*Abstract Co-Author*) Research Grant, General Electric Company

Vincent M. Mellnick, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

Nael E. Saad, MBBCh, Saint Louis, MO (*Abstract Co-Author*) Research Consultant, Veran Medical Technologies, Inc; Proctor, Sirtex Medical Ltd

Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

Alvaro Huete Garin, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To review the imaging manifestations of acute complications in the setting of chronic arterial and venous conditions. To present complications after surgical treatment that is seen on imaging.

TABLE OF CONTENTS/OUTLINE

Arterial: Buerger's Disease, Small Aorta Syndrome, Leriche Syndrome, Mycotic Aneurysms, Transplant arterial thrombosis, Penetrating Aortic Ulcer, Ruptured AAA, Complications of aortic dissection, Venous: Paget-Schroetter Disease, May-Thurner Syndrome, SVC Syndrome, Variceal Bleed, Transplant Kidney Renal Vein Thrombosis, Postoperative Complications, Clotted Aortic Endograft, Peripheral Arterial Infection, Graft Access Site Pseudoaneurysm, Post-op Bypass Surgery Wound Dehiscence, Aorto-enteric Fistula, Angina associated with LIMA CABG steal. Recognition of the patient who has an acute complication of a chronic vascular disorder and the early initiation of immediate management can significantly impact patient outcome. Depending on the clinical question, imaging can appropriately diagnose the underlying problem and provide critical information for the clinical team. In this exhibit, we present acute complications of chronic arterial and venous conditions seen on imaging and present some of the complications that are associated with different procedures used to treat these problems.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Christine O. Menias, MD - 2013 Honored Educator

Christine O. Menias, MD - 2014 Honored Educator

Christine O. Menias, MD - 2015 Honored Educator

Sanjeev Bhalla, MD - 2014 Honored Educator

Douglas S. Katz, MD - 2013 Honored Educator

Douglas S. Katz, MD - 2015 Honored Educator

Vasculitis in the Emergency Room Setting

All Day Location: ER Community, Learning Center

Awards

Cum Laude

Participants

Kristy L. Ratkowski, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

Vincent M. Mellnick, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

Meghan G. Lubner, MD, Madison, WI (*Abstract Co-Author*) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV

Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

Constantine A. Raptis, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Vasculitis is a broad entity that can affect small, medium, or large vessels. With an array of organ involvement, vasculitis can present to the emergency room with nonspecific complaints such as chest pain, cough, or abdominal pain. The diagnosis of these complaints is key to provide life-saving treatment. Emergency radiologists have the important role of identifying vasculitic characteristics on images and assisting with diagnosis in the emergency setting.

TABLE OF CONTENTS/OUTLINE

Large Vessel Vasculitis Giant Cell Arteritis Symptoms Imaging Takayasu's arteritis Symptoms Imaging Behcet's Disease Symptoms Lung involvement and imaging GI and cardiac involvement and imaging Medium Vessel Vasculitis Polyarteritis Nodosa Symptoms Renal involvement and imaging Testicular and cardiac involvement and imaging Intestinal and hepatic involvement and imaging Kawasaki Disease Symptoms Coronary involvement and imaging Small Vessel Vasculitis Microscopic polyangiitis Symptoms Lung involvement and imaging GI and cardiac involvement and imaging Eosinophilic granulomatosis Symptoms Lung involvement and imaging GI and cardiac involvement and imaging Granulomatosis with polyangiitis Symptoms Lung involvement and imaging GI and sinus/orbital involvement and imaging Henoch-Schonlein purpura Symptoms Abdominal involvement and imaging

Honored Educators

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Meghan G. Lubner, MD - 2014 Honored Educator

Meghan G. Lubner, MD - 2015 Honored Educator

Sanjeev Bhalla, MD - 2014 Honored Educator

Whole Foods: The Hidden Dangers of Eating Healthy

All Day Location: ER Community, Learning Center

Participants

Michael J. Chiang, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
 Carolyn K. Lim, DO, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
 Rex A. Parker III, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
 Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Spouse, Medical Director, F. Hoffmann-La Roche Ltd
 Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
 Christine O. Menias, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review potential medical complications related to whole food ingestion
 2. To demonstrate the radiologic findings of pathology resulting from whole food ingestion
 3. To discuss potential mimics, implications on patient management, and the importance of detailed patient history

TABLE OF CONTENTS/OUTLINE

- Survey of the relevant anatomy with emphasis on anatomic "danger zones"- Review of selected cases of medical complications as a result of whole food ingestion:
 1. Aspiration of a whole pecan
 2. Esophageal obstruction from vegan hot dog ingestion
 3. Gastric outlet obstruction by whole tapioca pearls
 4. Small bowel obstruction from intact citrus
 5. Cecal bezoar from uncooked kidney bean ingestion
 6. Complicated diverticulitis due to sunflower seed
 7. Additional selected cases- Differential diagnosis, including tumor, indigestible foreign body, and anatomic abnormalities- Appearance of food matter on imaging- Importance of relevant patient history- Management and follow-up considerations
CONCLUSION
 1. The pathology related to whole food ingestion appears as common radiographic diagnoses.
 2. Imaging appearance of food matter and detailed diet history may assist in elucidating the cause and affect patient management
 3. Mother was right, chew your food

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Sanjeev Bhalla, MD - 2014 Honored Educator
 Christine O. Menias, MD - 2013 Honored Educator
 Christine O. Menias, MD - 2014 Honored Educator
 Christine O. Menias, MD - 2015 Honored Educator

Direct MR and CT Correlation in Patients Presenting to the ED with Acute Abdominal Pain

All Day Location: ER Community, Learning Center

Participants

Bryan D. Pooler, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose

Meghan G. Lubner, MD, Madison, WI (*Presenter*) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV

Peter Bannas, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Scott B. Reeder, MD, PhD, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company Institutional research support, Bracco Group

Michael D. Repplinger, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose

Perry J. Pickhardt, MD, Madison, WI (*Abstract Co-Author*) Co-founder, VirtuoCTC, LLC; Stockholder, Celectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT ; Research Grant, Koninklijke Philips NV

TEACHING POINTS

The purpose of this exhibit is: 1. To demonstrate the MR findings of underlying pathology in patients presenting to the ED with a non-traumatic acute abdomen. 2. To directly show the correlation of CT and MR findings in acute abdominal pathology, utilizing cases from our prospective clinical trial. 3. To demonstrate the complementary value of T2-weighted, diffusion-weighted, and post-contrast T1-weighted MR images in diagnosis.

TABLE OF CONTENTS/OUTLINE

MR protocol for the acute abdomenMR vs. CT for acute abdominal symptoms Relative advantages and disadvantages Acute appendicitis Diagnostic performance MR imaging examples with CT correlation Alternative diagnoses to appendicitis Gastrointestinal Hepatopancreaticobiliary Genitourinary Peritoneal-basedFuture directions and summary

Honored Educators

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Meghan G. Lubner, MD - 2014 Honored Educator

Meghan G. Lubner, MD - 2015 Honored Educator

Perry J. Pickhardt, MD - 2014 Honored Educator

CT and MR Imaging of Gynecological Emergencies: What Residents and Fellows Should Know

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Identified for RadioGraphics

Participants

Yuko Iraha, Nishihara-Cho, Japan (*Presenter*) Nothing to Disclose
Masahiro Okada, MD, Nishihara-Cho, Japan (*Abstract Co-Author*) Nothing to Disclose
Rin Iraha, Okinawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Kimei Azama, Nishihara City, Japan (*Abstract Co-Author*) Nothing to Disclose
Sadayuki Murayama, MD, PhD, Nishihara-Cho, Japan (*Abstract Co-Author*) Nothing to Disclose
Takashi Matayoshi, MD, Naha, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukiko Nishikuramori, Okinawa, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The teaching points of this exhibit are: To know the gynecological diseases with the acute abdominal pain and hemorrhage To understand CT and MR findings of acute gynecological diseases To explain the importance of CT and MR images for the strategy in patients with acute gynecological conditions

TABLE OF CONTENTS/OUTLINE

History and physical examination findings of acute gynecological diseases are often nonspecific, but CT and MR findings are often characteristic and can lead to accurate diagnosis with proper image interpretation.1. Etiology of acute pelvic pain in women A) Torsion of ovarian tumor/normal ovary and torsion of isolated fallopian tube B) Rupture of endometriotic cyst and mature cystic teratoma C) Hemorrhagic ovarian cyst and Ectopic pregnancy: radiologic mimicker D) Pelvic inflammatory disease E) Acute degeneration, infarction or torsion of uterine leiomyomas2. Advanced imaging modalities for the diagnosis of acute gynecological diseases3. Differentiation between torsion and rupture of ovarian mass4. Systematic review of the diagnosis and management of acute gynecological diseases5. Retained products of conception (RPOC) and differential diagnosis A) CT and MRI feature of RPOC and its mimickers B) Uterine arterial embolization for RPOC

Top Ten in Emergency Gynecological Ultrasound

All Day Location: ER Community, Learning Center

Participants

Alejandro Garcia de la Oliva, MD, Sevilla, Spain (*Presenter*) Nothing to Disclose

Amparo Rivera, MD, Sevilla, Spain (*Abstract Co-Author*) Nothing to Disclose

Daniela D. Martins-Romeo, MD, Seville, Spain (*Abstract Co-Author*) Nothing to Disclose

Luis Cueto Alvarez, MD, Sevilla, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review the pathophysiology of the most common gynecological emergencies
2. To explain the utility of ultrasound in the diagnosis
3. To discuss the role of other techniques and procedures in women with lower abdominal pain

TABLE OF CONTENTS/OUTLINE

1. Pathophysiology of abdominal pain of gynecological origin
2. Review of imaging findings: - Ultrasound - Other: MRI, CT, Radiographs
3. Sample cases:
 - 3.1 Functional cysts
 - 3.2 Hemorrhagic cyst
 - 3.3 Follicular cyst rupture
 - 3.4 Ectopic pregnancy
 - 3.5 Ovarian torsion
 - 3.6 Pelvic inflammatory disease
 - 3.7 Endometriosis
 - 3.8 Ovarian hyperstimulation syndrome
 - 3.9 Complicated myoma
 - 3.10 Congenital malformation
4. Summary

Gastrointestinal (GI) Bleeding and Perforation: What Residents Should Understand in the Emergency Radiology

All Day Location: ER Community, Learning Center

Participants

Tomotaka Iraha, MD, Okinawa, Japan (*Presenter*) Nothing to Disclose
 Hiroaki Takara, Uruma, Japan (*Abstract Co-Author*) Nothing to Disclose
 Wataru Higashiura, MD, Ikoma, Japan (*Abstract Co-Author*) Nothing to Disclose
 Tadashi Yasutani, Uruma, Japan (*Abstract Co-Author*) Nothing to Disclose
 Masahiro Okada, MD, Nishihara-Cho, Japan (*Abstract Co-Author*) Nothing to Disclose
 Rin Iraha, Okinawa, Japan (*Abstract Co-Author*) Nothing to Disclose
 Yuko Iraha, Nishihara-Cho, Japan (*Abstract Co-Author*) Nothing to Disclose
 Kimei Azama, Nishihara City, Japan (*Abstract Co-Author*) Nothing to Disclose
 Sadayuki Murayama, MD, PhD, Nishihara-Cho, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To explain interpretations of gastrointestinal (GI) bleeding and perforation. 2. To know the image findings to understand the locations of GI bleeding or perforation on CT. 3. To plan a strategy for successful of IVR or surgery based on CT imaging. 4. Pitfalls of GI bleeding and perforation are also addressed.

TABLE OF CONTENTS/OUTLINE

1. The roles of CT scan for acute gastrointestinal (GI) bleeding and perforation
 2. Concepts of GI bleeding and perforation
 · Definition, Frequency, Classification
 3. Identification of the bleeding point by abdominopelvic CT
 · Unenhanced CT, Arterial phase of contrast-enhanced CT
 4. Significance of arterial embolization by IVR
 5. Technical difficulties of IVR for bleeding and Strategies for successful IVR
 6. CT findings of GI bleeding
 · High density in the GI tract, except fecal calculus, residue after barium enema examination and surgical anastomosis.
 7. CT findings of GI perforation
 · Extra-luminal air, Segmental GI wall thickening, Dirty mesenteric fat
 8. GI bleeding and perforation based on clinical cases
 · Bleeding of diverticulosis, cancer and inflammatory bowel disease
 · Gastroduodenal perforation, Small bowel perforation, Colorectal perforation
 9. Pitfalls of interpretations of GI bleeding and perforation

Complications of Nonvascular Image-guided Procedures of the Abdomen and Pelvis: A Comprehensive Review

All Day Location: ER Community, Learning Center

Participants

Vijayanadh Ojili, MD, San Antonio, TX (*Presenter*) Nothing to Disclose

Subramaniyan Ramanathan, MD, MBBS, Doha, Qatar (*Abstract Co-Author*) Nothing to Disclose

Saurabh Rohatgi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

Najla Fasih, MBBS, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The incidence of major complications associated with non-vascular image-guided procedures can be as low as 0.35% for liver biopsy to high as 20% for percutaneous renal procedures. Generic complications include bleeding and infection, whereas organ-specific complications are associated with biopsy of a specific target organ. Imaging can help in preventing these complications by careful planning of the procedure and can help in timely detection and management of these post-procedure complications.

TABLE OF CONTENTS/OUTLINE

Non-vascular image guided procedure include diagnostic and therapeutic procedures. A comprehensive organ-wise classification of these procedures: hepatobiliary (biopsy of native liver, liver mass, drainage of liver abscess, percutaneous biliary procedures), adrenals (biopsy of adrenal mass), genitourinary (biopsy of native kidney, renal mass, percutaneous nephrostomy, ureteric stenting), pancreas (biopsy of pancreatic mass, drainage of collection), spleen (biopsy of splenic lesion), pelvic viscera (biopsy of the prostate, pelvic mass, nodes, drainage of pelvic collections) and peritoneal cavity (biopsy of peritoneal and mesenteric mass, drainage of ascites). Multimodality case-based review of the complications associated with these procedures. Highlight the role of imaging in preventing, detecting and managing these complications.

Challenges in CT Pulmonary Angiography: Interpretation and Technical Considerations

All Day Location: ER Community, Learning Center

Participants

David D. Bates, MD, Boston, MA (*Presenter*) Nothing to Disclose

Jaroslav N. Tkacz, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review the history and role of CT pulmonary angiography (CTPA) in the evaluation of suspected venous thromboembolic disease (VTE). 2. Discuss technical challenges, pearls and pitfalls facing the radiologist when performing and interpreting CTPA. 3. Discuss ways to mitigate the challenges of performing and interpreting CTPA.

TABLE OF CONTENTS/OUTLINE

1. Review the epidemiology and history of imaging in venous thromboembolic disease (VTE). 2. Review protocols for optimal performance of CTPA. 3. Review interpretive and technical challenges. 4. Review of the current literature and practice guidelines. 5. Sample cases highlighting the challenges associated with CTPA. 6. Clinical management implications and the role of the radiologist.

Approach to Radiological Diagnosis of Non-traumatic Pediatric Pelvic Emergencies

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Ameya J. Baxi, MBBS, DMRD, San Antonio, TX (*Presenter*) Nothing to Disclose
Vijayanadh Ojili, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Dhanashree Rajderkar, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose
Amol S. Katkar, MD, San Antonio, CO (*Abstract Co-Author*) Nothing to Disclose
Achint K. Singh, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Kedar N. Chintapalli, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To discuss non-traumatic pediatric pelvic emergencies 2. To study the role of imaging in the diagnosis and evaluation of these conditions 3. To discuss imaging based differential diagnosis

TABLE OF CONTENTS/OUTLINE

Several types of diseases and conditions of gastrointestinal, reproductive or urinary system can cause severe pelvic pain. Identifying the cause may be challenging and clinical/ laboratory evaluation may not be sufficient to reach a diagnosis. Radiological evaluation using radiographs, ultrasound and cross sectional imaging are very important for timely diagnosis and prevention of complications. In this exhibit, we discuss the characteristic multimodality imaging findings and differential diagnosis of common non-traumatic pediatric pelvic emergencies. Increased awareness of such entities will contribute to optimized care of patients.

Aims/Objectives

Introduction

Pathology, imaging findings and role of imaging

Ovarian torsion
Ectopic pregnancy
Tubo-ovarian and pelvic abscess
Hematocolpos
Uterine AVM following miscarriage
Bowel obstruction
Appendicitis
Meckel's diverticulitis
Complications of Inflammatory bowel disease
Foreign body
Cystitis
Vesico-ureteric junction stones
Miscellaneous
Differential diagnosis
Conclusion
Teaching points

What to Expect When They're Expecting: MR Imaging of the Acute Abdomen in Pregnancy

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Hemang Kotecha, DO, Worcester, MA (*Presenter*) Nothing to Disclose

Lacey McIntosh, DO, MPH, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose

Hao S. Lo, MD, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose

Byron Y. Chen, MD, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose

Carolyn S. Dupuis, MD, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review the clinical indications and advantages of MRI over other imaging modalities in the evaluation of pregnant patients with acute abdominal pain. 2. Discuss differential diagnoses and MR imaging findings of acute abdominal pain during pregnancy.

TABLE OF CONTENTS/OUTLINE

Challenges in diagnosis of acute abdominal pain in pregnant patients Role of imaging Benefits of MRI over other modalities
Differential diagnoses Surgical Case Examples Acute Appendicitis Uterine Rupture Small Bowel Obstruction Nonsurgical Case
Examples Gastrointestinal (inflammatory bowel disease, biliary disease) Gynecologic (adnexal masses, degenerating leiomyoma)
Urologic (urinary tract obstruction/infection) Vascular (venous thromboembolic disease) Summary

Renal Trauma: MDCT Findings and Implications on Patient Management

All Day Location: ER Community, Learning Center

Participants

Shahnaz Rahman, MD, Boston, MA (*Presenter*) Nothing to Disclose
Arthur Baghdanian, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Armonde Baghdanian, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Anthony S. Armetta, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review the imaging presentations and AAST classification of renal injury. Illustrate important MDCT protocol points in renal trauma. Discuss the clinical implications of making the correct diagnosis.

TABLE OF CONTENTS/OUTLINE

When to suspect renal trauma (imaging findings adjacent to the kidney). Classification of renal trauma based on the AAST renal injury grading scale. Importance of differentiating active extravasation from urinary leak. Sample cases highlighting various presentations of renal injury. Clinical management implications in the various presentation of renal trauma. Pitfalls in renal trauma diagnosis.

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Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

So You Think You Can Grade - Renal Trauma

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Joel A. Gross, MD, MS, Seattle, WA (*Presenter*) Nothing to Disclose

Claire K. Sandstrom, MD, Seattle, WA (*Abstract Co-Author*) Speaker, Siemens AG

Jeffrey D. Robinson, MD, MBA, Seattle, WA (*Abstract Co-Author*) Consultant, HealthHelp, LLC; President, Clear Review, Inc;

Bruce E. Lehnert, MD, Seattle, WA (*Abstract Co-Author*) Research support, Koninklijke Philips NV

Bryan Voelzke, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Injury grading is commonly performed using the grading system provided by the American Association for the Surgery of Trauma (AAST) organ injury scale (OIS). While grading may appear simple to perform, there are ambiguities in this grading system resulting in variability in interpretation and implementation. In addition, there are several versions of the AAST OIS, and numerous references incorporate their own variable interpretations and expansions, which propagate to other references. This exhibit aims to identify the challenges and problems with the current system for renal injuries, provide a brief history of the development of this grading system, discuss challenges between a surgical grading system and radiologic grading system, suggest improvements and clarifications to enhance accurate evaluation and consistent grading of injuries, and review some of the newer grading systems and enhancements that have been published. It will incorporate several test questions along the way, to engage viewers and test their ability to accurately grade renal trauma.

TABLE OF CONTENTS/OUTLINE

Brief history of the AAST grading system. Evolution and updates to the AAST grading system. Errors, challenges and ambiguities in the grading system. Recommended improvements to the grading system. Newer proposed grading systems.

MDCT Imaging in Foreign Bodies

All Day Location: ER Community, Learning Center

Participants

Kishor L. Rajpal, Mumbai, India (*Presenter*) Nothing to Disclose

Ashwini Sankhe, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Nidhi K. Verma, MD, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Anagha R. Joshi, MD, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Rajarshi Aich, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Foreign bodies are uncommon but it is important to identify them early to prevent complications. Conventional radiography is the first imaging technique in suspected foreign bodies in the body. With the advent of MDCT scan, it is possible to quickly scan a body part, to detect and determine its exact location and its relations in the body. Establish the role of CT scan imaging modality in emergency cases to detect foreign body by reviewing few examples. Enlist advantages of CT scan - as a quick technique, its utility in cases of metallic foreign bodies where MRI cannot be used, to provide a 3D perspective in helping surgeons in management. Demonstrate the use of various CT techniques like multiplanar reconstruction, volume rendered technique, virtual bronchoscopy, etc.

TABLE OF CONTENTS/OUTLINE

1. Introduction
2. Advantages of CT scan over conventional imaging techniques and MRI in cases of suspected foreign bodies.
3. A pictorial review of imaging of foreign bodies from head to toe with CT scan techniques like multiplanar reconstruction, volume rendered technique, virtual bronchoscopy, etc. to further aid localization of foreign bodies including but not limited to, - Ingested foreign bodies - in the bowel, trachea - Foreign bodies related to trauma - ocular, spinal, cranial, chest - Iatrogenic foreign bodies - gossypiboma, retained endoscopic capsule.

The Value of the Individual Radiographic Signs in Diagnosing Heart Failure with Digital Chest X-ray

All Day Location: ER Community, Learning Center

Participants

Dustin Goei, MD, Dordrecht, Netherlands (*Presenter*) Nothing to Disclose
Patricia Visser, Dordrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Simone E. Cremers, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Ingrid Koster, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Pieter H. Van Der Valk, Dordrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marc C. Kock, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

According to the 2013 AHA Guideline for the Management of Heart Failure all patients with suspected or new-onset heart failure, or those presenting with acute congestive heart failure (CHF), should undergo a (digital) chest X-ray to assess heart size and pulmonary congestion. Although, chest X-ray is standard practice and routinely used, the clinical evidence is very limited (level C). Furthermore, the specific radiographic signs for detecting acute CHF on digital X-ray are not further specified in these guidelines. Teaching points are: To discuss the 12 individual radiographic signs (redistribution, artery-bronchus ratio, size of azygos vein and vascular pedicle, cardiomegaly, perivascular haze, peribronchial cuffing, Kerley lines, thickened fissures, perihilar haze, pulmonary consolidation, pleural effusion (examples in illustration). To discuss the individual signs in relationship to CHF staging and their clinical value according to local data and follow-up of 107 ER-patients.

TABLE OF CONTENTS/OUTLINE

Introduction
Guidelines and clinical evidence of digital chest X-ray in diagnosing acute CHF
Individual radiographic signs and diagnostic assessment
CHF staging using chest X-ray
Take home messages

Lessons Learned from the Aviation Industry: Incorporation of "Near Miss" Reporting into Resident On-Call Neuroradiology Education

All Day Location: ER Community, Learning Center

Participants

Michael T. Starc, MD, New York, NY (*Presenter*) Nothing to Disclose

Anjali Shah, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Nolan J. Kagetsu, MD, New York, NY (*Abstract Co-Author*) Spouse, Employee, Pfizer Inc;

TEACHING POINTS

1. Define the concept of the "near miss," as first used in the aviation safety industry. 2. Illustrate how our institution translates the near miss approach into a proactive neuroradiology focused resident case-based conference by providing example cases in quiz format. 3. Capturing near miss resident data is increasingly important in the era of 24/7 attending coverage.

TABLE OF CONTENTS/OUTLINE

The idea of a reportable "near miss" was first used in the commercial aviation industry to identify safety errors prior to any injury producing event. This approach has been successful in decreasing fatal aviation accidents. This exhibit describes our identification of "near miss" neuroradiology case data and its formal presentation at our biweekly resident-led conferences. Illustrative on-call neuroradiology cases will be presented in quiz format, including the following clinically relevant examples: overlooked skull base findings on head CT, findings only seen on CT scout images, 'first cut' imaging findings, symmetric/midline pathology, satisfaction of search, misidentified normal variants, and common artifacts. Key approaches to recognizing these patterns will be discussed, enforcing the idea that resident errors are both predictable and preventable.

Head Trauma Imaging in Modern Era

All Day Location: ER Community, Learning Center

Participants

Erhan Akpınar, MD, Ankara, Turkey (*Presenter*) Nothing to Disclose

Ekim Gumeler, MD, Ankara, Turkey (*Abstract Co-Author*) Nothing to Disclose

Ismail M. Kabakus, MD, PhD, Ankara, Turkey (*Abstract Co-Author*) Nothing to Disclose

Altan Gunes, MD, Ankara, Turkey (*Abstract Co-Author*) Nothing to Disclose

Kader Karli Oguz, MD, Ankara, Turkey (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. A comprehensive review of multimodality imaging findings of head trauma with patient selection and imaging algorithm. 2. To describe role of advanced imaging techniques in traumatic brain injury. 3. To predict neurocognitive and neuromotor outcome using multimodal imaging.

TABLE OF CONTENTS/OUTLINE

1. The epidemiology of traumatic brain injury. 2. Imaging algorithm and patient selection New Orleans CT Head Criteria Canadian CT Head Rule ACR Appropriateness Criteria and NICE guidelines: Selection of adults and children for CT head scan 3. Imaging findings of traumatic injuries Extraaxial hemorrhages (epidural, subdural and subarachnoid) Parenchymal injuries (concussion, contusion and second impact injury) Diffuse axonal injury Vascular injuries 4. Mild traumatic brain injury 5. Advanced imaging techniques Diffusion weighted imaging Susceptibility weighted imaging Proton Magnetic Resonance Spectroscopy Diffusion tensor imaging Resting-state Functional MRI 6. Conclusion

Where the Sun Don't Shine: The Spectrum of Injuries from Buttock Stab Wounds at a Level 1 Trauma Center

All Day Location: ER Community, Learning Center

Participants

Tom Campion, BMBCh, BA, London, United Kingdom (*Presenter*) Nothing to Disclose

Mayur Jadeja, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

Susan Cross, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The gluteal and perineal regions are surprisingly common locations for stab wounds presenting to a trauma department. A proportion of these will have significant and debilitating underlying injuries which can be demonstrated on multidetector computed tomography. These injuries are often subtle, and the reading radiologist must be alert to the possible injuries and the trajectory of the stab wound.

TABLE OF CONTENTS/OUTLINE

Gluteal stab wounds make up a surprisingly large proportion of stab wounds presenting to our level 1 trauma center. These are often young patients who can compensate for a large volume of blood loss initially, so it is important to have a low threshold for imaging. There are characteristic injuries associated with stab wounds in these regions, many of which have profound implications for the patient's quality of life. This educational exhibit will review the relevant pelvic anatomy, provide an approach to interpretation, and provide examples of characteristic and 'not-to-be-missed' injuries resulting from gluteal stab wounds, with data from our local trauma database. CT imaging examples will include: Rectal injury Urethral injury Sciatic nerve injury Vascular injury including arterial and venous hemorrhage, pseudoaneurysm and arteriovenous fistula formation

CT Evaluation of the 2nd and 3rd Trimester Placenta in Pregnant Trauma Patients: An Educational Exhibit

All Day Location: ER Community, Learning Center

Participants

Kathryn W. Jarrett, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

Jason Shames, MD, MS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

Candace D. Scace, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The 2nd/3rd trimester placenta has a variable appearance on CT. Normal-variants, such as succenturiate, bilobed, or circumvillate placentas and normal findings, such as myometrial contractions, venous lakes, chorionic villous plate indentations or small infarctions may mimic traumatic placenta pathology. Certain findings may help distinguish normal from abnormal placental pathology. In the setting of trauma, it is critical to distinguish normal from abnormal placental findings to ensure the safety of the mother and viability of the fetus.

TABLE OF CONTENTS/OUTLINE

Basic anatomy and physiology of the placenta Blunt trauma in pregnancy Placental appearance by trimester Case series of six 2nd/3rd trimester patients evaluated by CT following blunt trauma; one with findings suspicious for traumatic placental abruption

Imaging of Resuscitation and Emergency Resuscitation Devices - Lessons Learned from Post Mortem Computed Tomography

All Day Location: ER Community, Learning Center

Participants

Ferdia Bolster, FFR(RCSI), Baltimore, MD (*Presenter*) Nothing to Disclose

Zabiulah Ali, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

David Fowler, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

Barry D. Daly, MD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV

TEACHING POINTS

Post-mortem computed tomography (PMCT) is a growing hybrid sub-speciality of relevance to both radiology and forensic pathology. Complications from attempted cardiopulmonary resuscitation (CPR) and the use of resuscitation devices can be readily identified with PMCT, but may be undetectable at conventional autopsy due to its bluntly invasive nature. Awareness of these complications may help to improve resuscitative techniques and outcomes.

TABLE OF CONTENTS/OUTLINE

Brief discussion of the evolving role of PMCT and PMCT imaging protocols. Discussion of CPR procedures and review of related potential skeletal and visceral organ injuries identifiable with PMCT. Review commonly used resuscitation devices with sample images. Discuss malpositioning of devices detectable on PMCT, including airway support (endotracheal, laryngeal and nasopharyngeal tubes), intraosseous needles and vascular access, needle thoracostomy, and chest drains. Focus on related complications such as air embolism, pneumopericardium and pneumothorax that may be readily identified with PMCT, but not detectable at autopsy.

Dual Energy CT in Emergency Neuroimaging: Added Value and Novel Applications

All Day Location: ER Community, Learning Center

Participants

Christopher A. Potter, MD, Boston, MA (*Presenter*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

TEACHING POINTS

Our purpose is to: 1. Review the physics of Dual Energy CT (DECT). 2. Discuss DECT post processing applications, including a novel algorithm for calcium subtraction. 3. Demonstrate the utility of DECT in aiding detection and adding diagnostic confidence in neuroemergencies.

TABLE OF CONTENTS/OUTLINE

1. Review of DECT physics and DECT postprocessing algorithms of benefit in emergent neuroimaging, including: a) Three material decomposition to create iodine maps and virtual non-contrast images b) Novel application of three material decomposition to create calcium maps and virtual non-calcium images c) Tissue characterization using 2-material decomposition for bone removal d) Virtual monochromatic imaging 2. Demonstrate the utility of DECT using clinical examples: a) Improved visualization of vascular anatomy using bone subtraction to aid detection of small aneurysms or vascular dissection b) Enhanced detection of small subdural hemorrhages using bone subtraction c) Demonstration of active hemorrhage on iodine maps d) Differentiation of intracranial calcification from hemorrhage where the distinction may impact patient management e) Tissue differentiation of extra-axial masses with calcium subtraction images f) Improving grey-white differentiation or reducing beam hardening artifact with virtual monochromatic images

Honored Educators

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Don't Forget the Abdominal Wall! Important Traumatic Injuries Not to be Missed

All Day Location: ER Community, Learning Center

Awards

Cum Laude

Participants

Shanna Matalon, MD, Boston, MA (*Presenter*) Nothing to Disclose

Reza Askari, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Ketan Patel, MD, MBBS, Shrewsbury, MA (*Abstract Co-Author*) Nothing to Disclose

Jonathan Gates, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

Bharti Khurana, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. The anatomy of the abdominal wall is complex and it is important for radiologists to recognize potential sites of anatomic weakness. 2. Fewer than half of traumatic abdominal hernias are clinically evident, so a high index of suspicion is needed. 3. The injury can be overlooked by emergency radiologists upon initial review due to the presence of other associated intra-abdominal injuries. 4. Complications of traumatic abdominal wall hernias include delayed diagnosis, strangulation and incarceration of contents and recurrent hernia after treatment. 5. Potential pitfalls in diagnosis include incidental benign abdominal wall findings such as lipoma or fibroma, or traumatic rectus sheath hematoma, which would be managed conservatively.

TABLE OF CONTENTS/OUTLINE

1. Anatomy of the abdominal wall including illustrations and as visualized by various radiologic modalities including ultrasound, CT and MRI. 2. Radiologic appearance of traumatic abdominal wall injuries including muscle strain, abdominal wall and rectus sheath hematoma, superior and inferior lumbar hernia, spigelian hernia, Morel Levallée lesions. 3. Frequently seen associated intra-abdominal injuries. 4. Traumatic complications of preexisting hernias. 5. Radiographic appearance of common pitfalls in the evaluation of traumatic abdominal wall injuries.

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Bharti Khurana, MD - 2014 Honored Educator

Technical Parameters to Optimize Body Imaging in Polytrauma Patients

All Day Location: ER Community, Learning Center

Participants

Mohammad Shah, MBBS, London, United Kingdom (*Presenter*) Nothing to Disclose
Maaz A. Abbasi, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Susan Jawad, FRCR, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Charlie Sayer, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rebecca Greenhalgh, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ioannis Vlahos, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Research Consultant, Siemens AG Research Consultant, General Electric Company

TEACHING POINTS

A variety of technical parameters can have a profound effect on the technical adequacy and diagnostic quality of body CT performed for polytrauma patients. These factors can influence examination speed, study dose, artefact levels, diagnostic accuracy and interpretation confidence. This presentation highlights radiologist selectable parameters and their influence on image quality.

TABLE OF CONTENTS/OUTLINE

Based upon experience at a Level 1 trauma center we will highlight important issues and considerations when imaging the polytrauma patient.- Optimizing Arm positioning: impact on dose/image artefacts/diagnosis- Advantages/ disadvantages of split bolus single phase acquisition vs. single bolus two phase acquisition.- When are delayed series needed?- Contrast adaptations for unstable patients- When to ignore 'autokV' selection of low kVp- Impact of external devices- Artefacts- Causes of missed injuries and other pitfalls- Need for oral or rectal contrast?- Impact of patient centering on dose/image quality- Straight to CT protocols- Standard reconstructions and advanced image processing: iterative reconstruction, metal artefact reduction techniques- When is advanced processing helpful (oblique MPRs, surface shaded techniques)- New techniques (high pitch, dual energy)

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

Demystifying Orbital Emergencies: A Pictorial Review

All Day Location: ER Community, Learning Center

Awards

Magna Cum Laude

Participants

Viet D. Nguyen, MD, San Antonio, TX (*Presenter*) Nothing to Disclose
Daniel Verdini, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Maria P. Valencia, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Achint K. Singh, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Wilson Altmeyer, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Bundhit Tantiwongkosi, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review orbital anatomy Illustrate characteristic imaging features of each emergent entity with a systematic approach Discuss the role of imaging modalities, diagnostic pearls and pitfalls relevant to diagnosis, treatment planning and outcome

TABLE OF CONTENTS/OUTLINE

Based on a retrospective review of pediatric and adult orbital emergent cases imaged over a 5-year period (2010-2015) at a tertiary referral center, the following entities will be discussed: Infectious: orbital cellulitis, abscess, enophthalmitis, panophthalmitis, invasive fungal infection Vascular: ophthalmic vein thrombosis, acute ischemic optic neuropathy, vasculitis (Wegener's granulomatosis) Inflammatory: orbital pseudotumor, optic neuritis, sarcoidosis Traumatic: detachment syndrome, orbital compartment syndrome, foreign body, ballistic injury, etc.

Role of Imaging in Esophageal Emergencies

All Day Location: ER Community, Learning Center

Participants

Richard W. Ahn, MD, PhD, Dallas, TX (*Abstract Co-Author*) Co-founder, ViXa LLC; Stockholder, Vixa LLC
 Suhny Abbara, MD, Dallas, TX (*Abstract Co-Author*) Author, Reed Elsevier; Editor, Reed Elsevier; Institutional research agreement, Koninklijke Philips NV; Institutional research agreement, Siemens AG
 Rachna Madan, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Ethan K. Boothe, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
 Vasantha Vasan, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
 Sachin S. Saboo, MD, FRCR, Dallas, TX (*Presenter*) Nothing to Disclose
 Mina F. Hanna, MBBCh, MSc, Irving, TX (*Abstract Co-Author*) Nothing to Disclose
 Santosh K. Selvarajan, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Esophageal emergencies have varied clinical and radiographic presentations. Prompt and accurate diagnosis and treatment of esophageal emergencies is critical due to its high morbidity and mortality. Imaging is instrumental in the diagnosis of esophageal emergencies as clinical features are non-specific. In this exhibit, we provide an overview of imaging findings of esophageal emergencies using radiography, fluoroscopy and multiplanar and 3D CT, and will discuss imaging based differential diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Case based review of imaging findings of common and uncommon esophageal emergencies. 2. Each case will be used to illustrate key imaging pearls, diagnostic pitfalls, common mimics and differential diagnosis. The case based review will include, but is not limited to the following: a. Relevant anatomy of the neck and mediastinum b. Traumatic: Mallory-Weiss, Boerhaave, caustic injections, foreign bodies, intramural hematoma c. Iatrogenic: endoscopic and surgery related emergencies d. Esophageal malignancy related fistulas, lung abscess, and post stent complications e. Esophagitis f. General complications of esophageal perforation, abscess, fistulas, mediastinitis and tension pneumomediastinum 3. Diagnostic approach and problem solving

Honored Educators

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Suhny Abbara, MD - 2014 Honored Educator

Fool Me Once, Shame On Me. Fool Me Twice....

All Day Location: ER Community, Learning Center

Participants

Jonathan Schiavi, MD, Morristown, NJ (*Presenter*) Nothing to Disclose
Joseph C. DeMarco, DO, Valhalla, NY (*Abstract Co-Author*) Nothing to Disclose
Joanna Kee-Sampson, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Jay Patel, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Thaddeus M. Yablonsky, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Robyn C. Murphy, MD, Randolph, NJ (*Abstract Co-Author*) Nothing to Disclose
Sean K. Calhoun, DO, Long Valley, NJ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

At the conclusion of this presentation, the viewer will: Be cognizant of the pitfalls in interpreting ultrasound images produced by the technologists on patients who were not scanned by the radiologist in real time. Be able to detect erroneous or misleading annotations on images and be able to redirect the technologist to obtain additional views. Understand that the radiologist is ultimately responsible for each ultrasound study and therefore should always be vigilant, especially in a practice where technologists are the ones scanning the patients.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in quiz format: Pediatric Ultrasound 1. Pylorus Gastroesophageal junction mistaken for a pylorus 2. Intussusception Gangrenous Meckel diverticulum mistaken as an intussusception 3. Neonatal head ultrasound Vein of Galen malformation mistaken for cystic brain lesion Adult Ultrasound 1. Abdomen Caudate lobe mistaken for a pancreatic mass 2. Renal Abdominal aortic aneurysm mistaken as a renal cyst 3. Female pelvic Missed ruptured ectopic 4. Testicular Missed testicular torsion Testicular torsion that was not missed by radiologist but presented as normal by technologist

"...Clinical Correlation Indicated." - Making Sense of the Post-op Abdomen

All Day Location: ER Community, Learning Center

Participants

Joseph M. Miller, MD, MS, Los Angeles, CA (*Presenter*) Nothing to Disclose
Christopher T. Watterson, MD, W Hollywood, CA (*Abstract Co-Author*) Nothing to Disclose
David N. Ishimitsu, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Katherine M. Haker, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Radiologists are not surgeons, yet we are often called upon to evaluate surgical outcomes. Identifying complications is difficult without knowledge of the expected post-operative state. The purpose of this exhibit is to illustrate the spectrum of modern surgical intervention from esophagus to rectum, as well as the most frequent and most significant associated pathologies.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in a quiz format. Presentation is organized by organ with cases as follows: Esophagus I - Reflux: fundoplication (Nissen, Dor, Toupet); slipped wrap, tight wrap Esophagus II - Malignancy: esophagectomy (gastric and colonic conduits, Collis gastroplasty); redundancy, volvulus Stomach I - Obesity: bariatric surgery (lap band, sleeve, bypass); band erosion, marginal ulceration, stricture Stomach II - Malignancy: gastrectomy (total, Bilroth I/II); bezoar, intussusception Pancreas I - Malignancy: Whipple; pancreatic leak, bile leak Pancreas II - Pseudocyst: marsupialization, Puestow Biliary - Atresia: Kasai; cholangitis Colon I - Malignancy: proximal colectomy (low anterior), distal colectomy (abdominooperineal), exenteration; colovaginal fistula Colon II - Inflammatory bowel: ostomies, Hartmann pouch, ileal pouch-anal anastomosis; pouchitis

Neurosurgical Complications: What the Emergency Radiologist Needs to Know

All Day Location: ER Community, Learning Center

Participants

Christopher A. Potter, MD, Boston, MA (*Presenter*) Nothing to Disclose

Muhammad Abd-El-Barr, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

William Gormley, MD, MPH, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Srinivasan Mukundan, MD, PhD, Boston, MA (*Abstract Co-Author*) Institutional research support, Siemens AG Institutional research support, Toshiba Corporation Consultant, Toshiba Corporation

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

TEACHING POINTS

The purpose of this exhibit is to: 1. Discuss common neurosurgical procedures and their complications. 2. Review potential diagnostic pitfalls of neurosurgical complications. 3. Discuss the relevant information that the neurosurgeon needs to know.

TABLE OF CONTENTS/OUTLINE

1. Review common procedures in neurosurgery, such as burr hole/catheter placement, craniotomy and craniectomy, trans-sphenoidal surgery, endovascular procedures, posterior spine fusion and radiotherapy. 2. Demonstrate potential complications with clinical examples from our recent institutional experience, such as craniectomy site herniation; empyema and meningitis from subdural hemorrhage drainage complications; dural venous sinus thrombosis and pseudomeningocele following posterior fossa surgery; dissection, embolic material migration and embolic stroke in endovascular procedures; acute cerebral edema, pseudo progression and SMART in radiotherapy. 3. Discuss the diagnostic pitfalls and the information that the neurosurgeon needs to know associated with each example case.

Honored Educators

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Dose Reduction Techniques for Head CT following Traumatic Brain Injuries

All Day Location: ER Community, Learning Center

Participants

Krystal Archer-Arroyo, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

Thorsten R. Fleiter, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to: 1. Review methods used to decrease the dose of head CTs used to follow traumatic brain injury by decreasing the kV and mAs and using iterative reconstruction (IR) to decrease noise and artifact. 2. Demonstrate there is no significant difference in the diagnostic quality of the lower dose head CTs with filtered back projected or iterative reconstructed images. 3. Review additional traditional methods of reducing dose to radiosensitive organs such as the eyes and thyroid gland.

TABLE OF CONTENTS/OUTLINE

Introduction-Traumatic Brain Injuries (TBI) - Mechanisms - CT appearance-Follow-Up TBI Head CT protocol Imaging Technique- Routine Head CT Protocol- Low Dose Head CT - Dose Reduction- Image vs Diagnostic Quality Other Methods- Field-of-View- Shielding

Decisions Regarding Abdominal/Pelvic Percutaneous Image-guided Biopsies and Drainages: What the Emergency Radiologist Needs to Know

All Day Location: ER Community, Learning Center

Participants

Jennifer W. Uyeda, MD, Boston, MA (*Presenter*) Nothing to Disclose

Paul B. Shyn, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

Bharti Khurana, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Increasing utilization of imaging in the emergency department (ED) requires knowledge of the various imaging findings of acute intra-abdominal processes requiring intervention. 2. Emergency radiologists are often the first to diagnose abdominal or pelvic fluid collections and masses requiring intervention; understanding the key imaging findings is essential for early detection and guiding management. 3. Familiarity with the various indications and contraindications as well as the potential benefits and limitations of image-guided percutaneous biopsy or drainage are imperative for patient care.

TABLE OF CONTENTS/OUTLINE

Case based illustration of the imaging findings of typical and atypical lesions and fluid collections, appropriate for and not appropriate for urgent/emergent image-guided percutaneous interventions.-Review the emergent/urgent indications and contraindications for percutaneous biopsies and drainages-Review techniques used in percutaneous or endocavitary ultrasound (US) and computed tomography (CT)-guided biopsies and drainages, relevant to initial interpretation.-Illustrate imaging features of technically feasible versus infeasible percutaneous image-guided access-Show imaging characteristics of drainable and undrainable collections

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Bharti Khurana, MD - 2014 Honored Educator

Penis Fracture: Unusual Events, Typical Findings

All Day Location: ER Community, Learning Center

Participants

George C. Dantas, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Francisco D. Junior, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Joana Rayane P. Figueiredo, Brazil, Brazil (*Abstract Co-Author*) Nothing to Disclose
Antonio Rahal Junior, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Ronaldo H. Baroni, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcelo B. Funari, MD, Ribeirao Pires, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcelo C. Racy, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. In this study, we describe relevant anatomical points and typical findings of the main presentations of penile trauma. 2. Penile fracture constitutes a rare urological emergency. Most cases result from vigorous sexual intercourse. 3. The most common presentation is the rupture of the tunica albuginea of --one or both of the cavernous bodies and / or, less commonly, spongy. Urethral injury and thrombosis of the dorsal penile vein can be associated. 4. The ultrasonography is the initial method in the imaging evaluation, determining the site of rupture of the tunica albuginea and the local hematoma. 5. The magnetic resonance imaging is the most accurate diagnostic method, being reserved for the most difficult cases and for preoperative evaluation. 6. Image on T1 weighted MRI usually shows discontinuity of the tunica albuginea with low signal intensity and surrounding hematoma. 6. The intracavernous hematoma surrounding the tunica albuginea was better demonstrated at T2-weighted, and the signal intensity may vary with the stage of progression of hemoglobin metabolism. Contrast can be used in doubtful cases. 7. The retrograde urethrography should be performed in cases of suspected urethral injury.

TABLE OF CONTENTS/OUTLINE

Introduction. Penis anatomy. Clinical Presentation. Diagnostic Imaging. Conclusion.

Trauma Investigation...Correlation of Imaging with Autopsy Findings

All Day Location: ER Community, Learning Center

Participants

Sadaf F. Zaidi, MD, Spokane, WA (*Abstract Co-Author*) Nothing to Disclose
Robin D. Hines, MD, Spokane, WA (*Abstract Co-Author*) Nothing to Disclose
John Howard, MD, Spokane, WA (*Abstract Co-Author*) Nothing to Disclose
Sally Aiken, Spokane, WA (*Abstract Co-Author*) Nothing to Disclose
Jacob P. Pickering, BS, DO, Spokane, WA (*Presenter*) Nothing to Disclose
Scott A. Stewart, MD, Spokane, WA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Purpose or aim of the exhibit: • Multi-modality case based imaging review of the various post traumatic outcomes to the human body with gross pathologic correlation. • Discuss the role of imaging in specific trauma cases. • Describe subtle post-traumatic findings on imaging, well perceived on gross pathology specimens to better understand their imaging appearance. After reviewing this exhibit the reader will: • Be able to apply the principles of radiologic-pathologic correlation to the interpretation of post-traumatic radiologic studies. • Better understand subtle post traumatic appearances of various consequences of trauma related to particular mechanisms of trauma. • Have developed a diagnostic approach to acute trauma to facilitate clinical decision-making and management in patients with trauma

TABLE OF CONTENTS/OUTLINE

Content organization: • Review various cases of trauma with their mechanisms, imaging appearance and gross pathology appearances. • Discuss case based primary imaging modalities and protocols used in the setting of acute trauma. • To review imaging patterns and their gross appearance on autopsy specimens in various forms of trauma.

Principles of CT Angiography in the Emergency Department: How to Maximize Contrast Enhancement and Image Quality while Minimizing Radiation and Contrast

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Martin L. Gunn, MBChB, Seattle, WA (*Presenter*) Research support, Koninklijke Philips NV; Spouse, Consultant, Wolters Kluwer NV; Medical Advisor, TransformativeMed, Inc;

Toshimasa J. Clark, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

After this exhibit, the viewer will be able to: 1. Understand the principles of contrast flow, and what influences contrast enhancement. 2. Change their local protocols to maximize enhancement, while minimizing variability, contrast usage, and radiation dose. 3. Investigate the use of newer technologies (dual energy CT, ultra-fast CTA) to further improve CTA quality.

TABLE OF CONTENTS/OUTLINE

This exhibit is designed to simplify the complex topics of contrast dynamics and modern CT technologies, using illustrations, and very brief animations to guide the learner through several topics. There will be a focus on CTA as applicable to the ED. Outline: Principles of contrast flow. Contrast agents and timing techniques. Factors that influence iodine enhancement. Iodine flux (concentration, rate, viscosity, patient factors (iv line, cardiac output, gender, age, cardiac status). Volume of contrast, How to time CT relative to iodine arrival. kVp Low-Dose CT Angiography. Dual Energy CT Angiography. CTA on ultrafast (wide detector array and dual-source) scanners.

Tracheobronchial Injuries: Current Imaging Strategies to Guide Management

All Day Location: ER Community, Learning Center

Awards

Certificate of Merit

Participants

Charlie Sayer, MBBS, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Constantine A. Raptis, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Madhan Kuppasamy, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ioannis Vlahos, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Research Consultant, Siemens AG Research Consultant, General Electric Company

TEACHING POINTS

1. Characterization of the etiology, distribution and morphology of Tracheobronchial Injury (TBI) 2. Impact of TBI imaging characterization on management

TABLE OF CONTENTS/OUTLINE

A multicentre Level 1 trauma center collaborative radiological and surgical review of multiple treated cases to highlight current concepts in the imaging and management of TBI to include: 1. Mechanisms (blunt, penetrating, iatrogenic, aspirational) 2. Impact of normal anatomy on injury location/extent 3. Beyond "fallen lung" - more useful CXR/CT patterns 4. Injury morphology (transverse, longitudinal, composite, anterior/posterior, cervical/intrathoracic etc) 5. Surgical considerations (access, repair techniques) 6. Imaging criteria for surgical v conservative management 7. Role of occlusive balloons, single bronchus intubation, stents 8. Pediatric variations 9. Knife/Gunshot/Complex transmediastinal trauma 10. Aetiology/management of iatrogenic injuries 11. Pitfalls, peripheral airways, missed injuries and complications 12. Utility of advanced image processing

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Sanjeev Bhalla, MD - 2014 Honored Educator
Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

Periprosthetic Hip Fractures in the Emergency Department: What the Orthopedic Surgeon Wants to Know

All Day Location: ER Community, Learning Center

Participants

Richard A. Marshall, MD, -, MA (*Presenter*) Nothing to Disclose

Michael Weaver, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

Bharti Khurana, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review of radiographic appearance of common periprosthetic femoral fractures encountered in the Emergency Department2. Recognize the radiological findings that are associated with increased fracture risk, and those that are critical for determining management of periprosthetic fractures3. Understand the terminology and classification system most commonly used by orthopedic surgeons to guide treatment decisions based on fracture location, distribution, implant stability, and residual bone quality

TABLE OF CONTENTS/OUTLINE

1. Review the types of hip prostheses most commonly used by orthopedic surgeons, including cemented and press-fit prostheses, and their expected radiologic appearance2. Fracture terminology and classification systems used by Orthopedic Surgeons, including overview of the Vancouver criteria, with emphasis on: a. The most common radiologic patterns of periprosthetic femoral fractures b. Radiologic determinants of prosthesis stability and proximal bone quality, and how these parameters guide treatment decisions3. Case based review of the most common fracture patterns and radiologic signs of prosthesis failure in multiple imaging modalities4. A check list approach to interpreting these radiographs in the Emergency Department with emphasis on what not to miss and what must be included in the reports

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Bharti Khurana, MD - 2014 Honored Educator

First Trimester OB Ultrasound in ER Setting: Imaging Potpourri

All Day Location: ER Community, Learning Center

Participants

Z Liu, MD, Boston, MA (*Presenter*) Nothing to Disclose

David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Nagaraj-Setty Holalkere, MD, Boston, MA (*Abstract Co-Author*) Owner, imaginglink, LLC

TEACHING POINTS

Vaginal bleeding and abdominal pain are common symptoms that lead to a visit to the emergency room. There are a multitude of pregnancy related complications and some of which may require emergent surgery and early diagnosis is imperative. This exhibit aims to review and discuss emergent and non-emergent complications of pregnancy during first trimester.

TABLE OF CONTENTS/OUTLINE

1. Review the normal sonographic findings in the first trimester. 2. Discuss signs suggestive of abnormal embryonic development. 3. Discuss emergent causes/cases of abdominal pain seen on pelvic ultrasound: Ectopic pregnancy, early pregnancy failure/fetal demise, gestational trophoblastic disease, uterine rupture, ovarian torsion, and PID. 4. Discuss non-emergent causes/cases of abdominal pain seen on pelvic ultrasound: adnexal masses, leiomyomas and multifetal pregnancies. 5. Pregnancy of unknown location and management guidelines.

Added Value of Arterial Enhancement Fraction Color Maps for the Early Detection of Necrosis in Acute Pancreatitis

All Day Location: ER Community, Learning Center

Participants

Sharad Maheshwari, MD, Mumbai, India (*Presenter*) Nothing to Disclose

Abhijit A. Raut, MD, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The exhibit aims to discuss: 1, Highlight limitation of conventional methods of evaluating CT scan in acute pancreatitis. If contrast CT is done in early stage (before 72 hours) it may be misleading regarding the morphologic severity of the pancreatitis, and may underestimate the presence and amount of necrosis. 2. Introduction to the concept of Arterial Enhancement Fraction (AEF) Color Maps (ratio of the attenuation increment during the arterial and portal venous phases compared with the unenhanced image). 3. Discuss the clinical utility of AEF maps in detecting necrosis in an emergency setting in early stage when CT scan is done before 72 hours. .4. Show interesting cases where necrosis was detected at early stage and confirmed on follow up scan.

TABLE OF CONTENTS/OUTLINE

1. Pathophysiology of acute pancreatitis.2. Role of contrast CT imaging in diagnosis and management of acute pancreatitis.3. Scanning technique and multiphase image acquisition.4. Detection of optimal phase based on scan timing,5. Software analysis for AEF color maps.6. Radiological examples, including normal pancreatic tissue, acute edematous interstitial pancreatitis and necrotizing pancreatitis. 7. Reporting format.

Urgent and Emergent Radiological Diagnoses in Patients of Oncology

All Day Location: ER Community, Learning Center



Discussions may include off-label uses.

Participants

Santhosh K. GeethaVirupakshappa, MD, MBBS, Mumbai, India (*Presenter*) Nothing to Disclose

Shashikant Juvekar, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Nikshita A. Jain, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Sureshkumar G, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Somesh Singh, MBBS, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

Ashita Rastogi, MBBS, MD, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

List the system wise (anatomical) oncological emergencies. Discussion of imaging findings and role of radiologist in guiding further evaluation or management in appropriate cases.

TABLE OF CONTENTS/OUTLINE

Introduction Oncological emergencies according to organ systems Discussion of selected conditions and imaging findings Role of radiologist in guiding clinicians for further evaluation and management Summary

Back to the Basics: Pneumoperitoneum on Radiograph, A Case-Based Review

All Day Location: ER Community, Learning Center

Participants

Wenjia Wang, MD, Cambridge, MA (*Presenter*) Nothing to Disclose

Alejandro M. Heffess, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review the signs of pneumoperitoneum on radiograph. Review potential mimickers of pneumoperitoneum on radiograph. Illustrate the underlying anatomic causes of the peritoneal signs by briefly explaining its relevant anatomy and comparison with corresponding cross-sectional imaging.

TABLE OF CONTENTS/OUTLINE

This exhibit will showcase common and uncommon signs of pneumoperitoneum on radiograph, as well as their potential mimickers. Signs of retroperitoneal free air will also be briefly reviewed. Cases will be presented as "unknowns" with subsequent slides identifying the imaging finding and explaining the anatomic cause for its appearance. Intraperitoneal free air Football sign Rigler's sign Continuous diaphragm sign Double gastric fundus sign Lucent liver sign Leaping dolphin sign (diaphragmatic slip sign) Liver edge sign Hepatic notch sign Falciform ligament sign Ligamentum teres sign Cupola sign Doge's cap sign Inverted V sign Telltale triangle sign Decubitus abdominal sign Pseudoperitoneum Pseudoriglers Basal linear atelectasis Outside line Chilaiditis syndrome Pneumomediastinum Pneumatosis intestinalis Abscess Pneumoretroperitoneum (brief)

Bowel Obstruction: The Basic ABC's and Beyond

All Day Location: ER Community, Learning Center

Participants

Urvi P. Fulwadhva, MD, Boston, MA (*Presenter*) Nothing to Disclose

TEACHING POINTS

Bowel obstruction is a common differential diagnosis in patients undergoing CT of the abdomen and pelvis within the emergency department as part of their abdominal pain work up. It is usually secondary to functional or mechanical obstruction of the bowel. This educational exhibit is a case based review of bowel obstruction with emphasis on causes, imaging findings, complications and management.

TABLE OF CONTENTS/OUTLINE

1. Review mechanical and functional causes of bowel obstruction and differentiate between intrinsic, extrinsic and intraluminal etiologies. 2. Case based review of bowel obstruction from the stomach to the rectum with emphasis on diagnostic findings, classifying degree of obstruction, how to find the transition point, associated findings at the transition point and complications. 3. Briefly discuss management especially focusing on cases which need emergent surgical consultation/exploration.

Emergency Radiology Sunday Case of the Day

Sunday, Nov. 29 8:00AM - 11:59PM Location: Case of Day, Learning Center



AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to Disclose
 Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
 Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Melanie Wegener, Garden City, NY (*Abstract Co-Author*) Nothing to Disclose
 Ania Z. Kielar, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
 Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
 Puneet Bhargava, MD, Shoreline, WA (*Abstract Co-Author*) Editor, Reed Elsevier
 Nicholas M. Beckmann, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Ritu Bordia, MBBS, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Recognize key imaging findings on multimodality imaging of emergency/trauma patients. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Recommend appropriate management including image-guided interventions.

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator
 Douglas S. Katz, MD - 2013 Honored Educator
 Douglas S. Katz, MD - 2015 Honored Educator
 Puneet Bhargava, MD - 2015 Honored Educator

SSA05

ISP: Emergency Radiology (Utilization and Practice)

Sunday, Nov. 29 10:45AM - 12:15PM Location: N228

ER

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Jamilik-Omari Johnson, MD, Atlanta, GA (*Moderator*) Nothing to Disclose
Aaron D. Sodickson, MD, PhD, Wayland, MA (*Moderator*) Research Grant, Siemens AG; Consultant, Bracco Group

Sub-Events

SSA05-01 Emergency Radiology Keynote Speaker: Importance of Studying Utilization Trends in Imaging: How We Do It?

Sunday, Nov. 29 10:45AM - 10:55AM Location: N228

Participants

Vijay M. Rao, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

SSA05-02 The Surprising Continued Growth of Imaging Utilization in Emergency Departments

Sunday, Nov. 29 10:55AM - 11:05AM Location: N228

Participants

Manisha C. Patel, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
David C. Levin, MD, Philadelphia, PA (*Abstract Co-Author*) Consultant, HealthHelp, LLC; Board of Directors, Outpatient Imaging Affiliates, LLC
Laurence Parker, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Vijay M. Rao, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

A recent study from a single large teaching hospital in 2014 suggested that the use of imaging in the emergency department (ED) may be decreasing. Our purpose was to study this issue on a nationwide basis.

METHOD AND MATERIALS

The national Medicare Part B Physician/Supplier Procedure Summary Master Files from 2001-2013 were evaluated. These files cover all patients in traditional Medicare fee-for-service (37.3 million in 2013). Volumes of radiography, CT, and noncardiac ultrasound (US) - the 3 major types of ED imaging - were determined by aggregating all CPT codes within each modality. Exams performed in EDs were determined by using Medicare's place-of-service codes. Utilization rates per 1000 Medicare beneficiaries were calculated. Medicare specialty codes were used to determine the specialty of the interpreting physicians.

RESULTS

The ED utilization rate per 1000 of radiography increased every year from 238 in 2001 to 323 in 2013 (+36%). In ED CT, the rate increased every year from 48 in 2001 to 158 in 2013 (+229%). The CT increase would have been even greater except for code bundling of CT scans of the abdomen and pelvis in 2011. In ED noncardiac US, the rate also increased every year from 8.6 in 2001 to 22.2 in 2013 (+158%). In 2013, radiologists interpreted 98% of ED radiographs and 99% of CT scans. They interpreted 88% of noncardiac US studies. The remaining US exams were interpreted by vascular surgeons (5%), ED physicians (3%), general surgeons (2%), or cardiologists (1%).

CONCLUSION

There has been a steady increase in the utilization rates of the 3 major types of imaging that are performed in ED patients. The increase has been quite sharp in CT and noncardiac US. Despite the recent report, there is no evidence that ED imaging use is declining. Radiologists strongly predominate in interpretation of all types of imaging in EDs, despite persistent efforts by some other specialties to gain a foothold.

CLINICAL RELEVANCE/APPLICATION

NA

SSA05-03 Diagnostic Yield and Clinical Utility of Abdominopelvic Computed Tomography Following Emergent Laparotomy for Trauma

Sunday, Nov. 29 11:05AM - 11:15AM Location: N228

Participants

Adam K. Haste, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose
Scott D. Steenburg, MD, Zionsville, IN (*Abstract Co-Author*) Nothing to Disclose
Brian L. Brewer, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Utility of Computed Tomography (CT) imaging has been well validated in the initial assessment of trauma patients. However, there are some patients who are deemed too unstable to undergo CT scan and initially require exploratory laparotomy. Occasionally additional injuries are identified on CT if performed after surgery; however, to our knowledge, there have been no studies investigating types and severity of such injuries. The purpose of this study was to determine the diagnostic yield and clinical utility

of CT following emergent laparotomy in the setting of trauma.

METHOD AND MATERIALS

The trauma databases of two urban level 1 trauma centers were queried over a 5 year 8 month period for patients who underwent abdominopelvic CT imaging within 48 hours of emergent exploratory laparotomy. CT reports and images were retrospectively reviewed to identify all injuries diagnosed by post-laparotomy CT. All injuries diagnosed at laparotomy were identified by reviewing the operative records. Comparisons were made between operative and CT findings.

RESULTS

92 patients met inclusion criteria. 64 patients (69.6%) had additional injuries not identified during laparotomy. There were 20 unidentified solid organ injuries, including 4 splenic, 4 hepatic, and 7 renal injuries. CT upgraded severity of 4 liver injuries that were diagnosed at initial surgery. Of 16 patients with suspected renal injury at surgery, there were 12 renal injuries confirmed by CT. 11 patients (12.0%) had CT injuries severe enough to prompt further intervention, including 5 angiography/embolizations and 6 re-operations. Fractures were found in 59 (64%) patients.

CONCLUSION

Overall there was high concordance between injuries identified on CT and those which could reasonably be expected to be identified at surgery. In total, 70% of patients had undiagnosed injuries; however, some of these injuries, such as fractures, would not be expected to be diagnosed at surgery. 12% of patients had injuries on CT severe enough to require further intervention. Post laparotomy CT adds value in trauma patients who initially require emergent exploratory laparotomy.

CLINICAL RELEVANCE/APPLICATION

Post laparotomy CT identifies clinically important injuries in a small but significant percentage of trauma patients who require initial emergent exploratory laparotomy and is recommended for complete evaluation of traumatic injuries.

SSA05-04 Duplicate Cardiothoracic Imaging in the ED: Is there Room for Improvement?

Sunday, Nov. 29 11:15AM - 11:25AM Location: N228

Participants

Tarek N. Hanna, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Waqas Shuaib, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
James Matthew Kerchberger, BS, Atlanta, GA (*Presenter*) Nothing to Disclose
Jamlik-Omari Johnson, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Examine Emergency Department (ED) ordering practices in patients receiving both chest radiography (CXR) and chest computed tomography (CCT).

METHOD AND MATERIALS

Consecutive ED patients receiving both CXR and CCT in a single ED visit from 6/2009-3/2013 were included. For each exam, time of order entry (TOE), time of study completion (TSC), and time of final interpretation (TOI) was recorded and analyzed. TOE was the time of electronic order entry by the ED provider. TSC was when images were uploaded to PACS. TOI was the time of final radiology report availability. Cases with incomplete data were excluded.

RESULTS

3627 patients (66.5% male, average age 49.2 ±36 years) met inclusion criteria. In 3437 (94.8%) patients the CXR was ordered first, in 43 (1.2%) the CCT was ordered first, and in 91 (2.5%) the CCT and the CXR were ordered simultaneously. Of the 91 patients with simultaneous CCT and CXR orders, the CXR was completed first in 78 cases (85.7%); none of the 91 patients had chart documentation to explain the simultaneous orders. In only 50.6% (1740/3437) of exams where CXR was ordered first, was the final CXR report available prior to CCT order placement. Of the 43 patients in whom CCT was ordered first, only 2 (4.6%) had the final CCT report available prior to the CXR order. In 47.8% (1735/3627) of all cases, the second imaging modality (whether CT or CXR) was ordered prior to final report availability of the first exam. In 7.3% (n=263/3627) of all cases, the second imaging modality (whether CT or CXR) was ordered prior to the image availability of the first exam.

CONCLUSION

Making secondary cardiothoracic imaging decisions without having the final radiology report for the primary exam (47.8% of all cases) or ordering a secondary cardiothoracic imaging study prior to image availability for the first exam (7.3%) may be appropriate in certain situations, but further investigation of these trends is needed to identify possible inappropriate resource utilization. In 2.5% of cases, CCT and CXR were ordered simultaneously, which may occur secondary to perceived wait times for CCT. Targeted technology solutions may alleviate some of this redundancy.

CLINICAL RELEVANCE/APPLICATION

Primary imaging results should influence secondary imaging decisions. Efficient imaging in the ED helps arrive at an accurate diagnosis while minimizing cost, radiation, and patient turn around time.

SSA05-05 Radiological Workflow in Mass Casualty Incidents: Evaluation of Two Level 1 Trauma Sites in a Large-scale Exercise

Sunday, Nov. 29 11:25AM - 11:35AM Location: N228

Participants

Fabian Mueck, Munich, Germany (*Presenter*) Nothing to Disclose
Maximilian Muggenthaler, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Lucas L. Geyer, MD, Charleston, SC (*Abstract Co-Author*) Speaker, General Electric Company
Kathrin Weber, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Wirth, MD, MSc, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Aim of study was to compare the in-house workflow of two level 1 trauma sites in the case of a mass casualty incident (MCI) with a particular focus on CT management.

METHOD AND MATERIALS

A MCI of 70 patients was simulated by actors. According to a local MCI patient distribution matrix, the on-site triage assigned 7 cases to trauma site A (long in-house distances) and 5 patients to the completely independent second trauma site B (short in-house distances) of the same hospital. Within a most realistic simulation of in-house treatment several time points were measured and compared (e. g. with respect to arrival: time to triage, time to trauma room, time to CT and time to one of the two possible ending points which were arrival at the intensive care unit or at the operating theatre).

RESULTS

Site A needed more time (minutes) from arrival to ending point (A:31.84; B:21.60; P=0.059). According to the distances the times were longer to both trauma room (A:8.46; B:2.73, P = 0.008), and CT room (A:1.81; B:0.06, P=0.008). The observed shorter stay on the CT table did not compensate these effects. (A:6.42; B:7.31, P=0.705).

CONCLUSION

Facility design has a major influence on the time needed for in-house treatment. Short distances allow reaching end-points within 22 min. Considering CT it is possible to serve up to 6 patients per scanner-hour by using a standard protocol and up to a theoretical maximum of 13 patients by using a CT triage procedure.

CLINICAL RELEVANCE/APPLICATION

Considering polytrauma patients in CT, optimized facility design with short distances allows to serve up to 6 patients/h using a standard protocol, and up to a theoretical maximum of 13 patients/h by using a more simple triage procedure.

SSA05-06 Time to Write an Obituary? Sacrum and Coccyx Radiographs have Limited Clinical Impact in the Emergency Department

Sunday, Nov. 29 11:35AM - 11:45AM Location: N228

Participants

Mahniya Sadiq, BS, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
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Noah G. Ditkofsky, MD, Saint Johns, NL (*Presenter*) Nothing to Disclose
Abhijit Datir, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Saurabh Rohatgi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Marc D. Benayoun, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Determine the yield and clinical impact of sacrum and coccyx radiographs (SC-XR) in the Emergency Department (ED).

METHOD AND MATERIALS

Consecutive SC-XR obtained in the EDs of 4 hospitals over a 5 year period were categorized as positive for acute fracture or dislocation, negative, or other. Other documented incidental findings that may have clinical relevance. Five follow-up metrics were analyzed: follow-up imaging in the same ED visit, follow-up imaging within 30 days, new pain medication prescriptions at discharge, clinic follow-up recommended at discharge, and surgical intervention within 60 days.

RESULTS

687 patients met inclusion criteria (48.1 years, 61.6% female). 91.3% were negative, 8.4% (n=58/687) were positive, and 0.3% (n=2/687) had other findings (lytic metastatic disease, Pagets). Regarding follow-up: 5.7% (n=39) had CT or MRI in the same ED visit, 4.3% (n=29) had advanced imaging within 30 days, 65.8% of patients received recommendations for clinical follow-up, and 47.9% of patients were prescribed new pain medications. Due to inherent practice differences, the level 1 trauma center was analyzed separately. At the level 1 trauma center (n=335, 44.8 years, 53.4% female), when comparing positive and negative SCXRs, there was no significant difference in follow-up ED imaging (p=0.19), 30 day imaging follow-up (p=0.77), medication administration (0.06), or clinical follow-up (p=0.14). At the level 2 trauma centers (n=352, 51.3 years, 69.4% female) there was a significant difference in same day (p=0.04) and 30-day follow-up imaging (p=0.001), but no difference in pain medication (p=0.94) or clinic follow-up (p=0.09). 0% (0/58) of the positive cases had surgical intervention. At our institution, the average global charge for SC-XRs over the study period was \$230 (\$201-263), \$24 professional and \$206 technical, for a total cost over the study period of \$158,010.

CONCLUSION

ED SC-XRs have costs and ionizing radiation, and in some EDs result in more advanced imaging. However, the results of SC-XR did not affect pain medication administration or clinic follow-up. No positive SC-XRs resulted in surgical intervention.

CLINICAL RELEVANCE/APPLICATION

As ED SC-XRs do not affect clinical management, their use can be curtailed, and patients treated conservatively. This will result in radiation and cost savings, and may decrease ED length of stay.

SSA05-07 Incidental Findings in Patients with Multiple Injuries: How to Proceed?

Sunday, Nov. 29 11:45AM - 11:55AM Location: N228

Participants

Thomas Lehnert, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Moritz H. Albrecht, MD, Frankfurt am Main, Germany (*Presenter*) Nothing to Disclose
Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Nour-Eldin A. Nour-Eldin, MD, PhD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Moritz Kaup, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Jan-Erik Scholtz, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Multislice computed tomography (MSCT) is the diagnostic criterion standard for the initial evaluation of patients with suspected multiple injuries. Besides scanning for injuries directly related to the initial trauma, MSCT scans can reveal pathologies unrelated to the trauma of clinical relevance. The aim of the present study was to determine the frequency and follow-up course of incidental findings in patients with multiple injuries.

METHOD AND MATERIALS

This is a retrospective analysis of prospectively collected data on 2,242 patients with suspected multiple injuries at a Level I trauma center from 2006 to 2010. The MSCT reports were retrospectively reviewed regarding abnormal findings not related to trauma. These incidental findings were classified on a four-point level scoring system with respect to clinical importance and urgency for further diagnostic and therapeutic procedures.

RESULTS

During initial trauma center evaluation in the emergency department, 2,246 patients met our inclusion criteria. A total of 2,036 patients (90.7%) underwent MSCT; 1,142 (50.9%) of the patients had one or more incidental findings. A total of 2,844 incidental findings were detected. Overall, 349 tumor findings were noted (12.3% of all incidental findings); 113 findings were suspicious for malignant processes or metastasis. According to our classification, 168 (5.9%) of the incidental findings required urgent follow-up (Level 4), and 527 (18.5%) of the incidental findings required a follow-up before discharge (Level 3).

CONCLUSION

MSCT in patients with multiple injuries reveals one or more incidental findings in more than one of two patients. A scoring system classifying for relevance of incidental findings was introduced and could be applied in routine trauma care in the future.

CLINICAL RELEVANCE/APPLICATION

The consequent handling of incidental findings may add an extra burden for trauma surgeons and emergency physicians but should lead to improvements in health care for the patients. Especially in trauma patients, the reviewing radiologist should pay attention to both the presence of traumatic injuries and the incidental findings and communicate both to the ordering physician.

SSA05-08 Completion CT Chest Abdomen Pelvis after Acute Head and Neck Trauma: Incidence of Acute Traumatic Pathology

Sunday, Nov. 29 11:55AM - 12:05PM Location: N228

Participants

Michael S. Kelleher JR, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Guangzu Gao, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Michael F. Rolen, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Syed A. Bokhari, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

At our institution, patients found to have acute head or neck trauma will receive a CT chest abdomen pelvis (CT CAP) even in the absence of signs or symptoms to suggest bodily trauma. The purpose of our study was to determine the incidence of acute traumatic pathology on these CT CAP exams.

METHOD AND MATERIALS

After receiving IRB approval, a retrospective chart review was performed. Patients who presented to our institution's emergency department over a one year period (8/1/2013-7/31/2014) with findings of acute head and neck trauma who subsequently went on to have a CT CAP were identified. Exclusion criteria were as follows: proximal extremity/rib fractures identified on plain film prior to CT CAP, chest pain, abdominal pain, CPR after the traumatic event, soft tissue hematomas identified on physical exam and hypotension. We then analyzed the clinical course and imaging results of each patient meeting study criteria. Specifically, for the head/neck CTs, type of injury was divided into 5 broad categories: intra-axial bleed, extra-axial bleed, facial bone fracture, skull fracture, and cervical spine fracture. Mechanism of injury was categorized as follows: fall from standing, fall from height (greater than 6 feet), motor vehicle collision, and assault. The frequency and percentage of each of these categories were calculated. For the CT CAP exams, acute traumatic injuries were recorded, and the incidence of acute traumatic injury was calculated.

RESULTS

101 (8.6%) CT CAP studies performed in our ED during the one year period met study criteria. The most frequent mechanism of injury in this group was a fall from standing (76.2%). The most common traumatic head/neck injury in this group was an extra-axial hemorrhage (49.5%). Of all CT CAP studies, only one study demonstrated an acute traumatic injury (non-displaced 5th and 6th rib fractures). This finding was of no significant clinical consequence.

CONCLUSION

In the setting of low-velocity trauma, patients with acute head/neck injury without signs or symptoms of bodily injury should not receive a CT CAP. This data can be used to restructure trauma algorithms, which will reduce financial costs and better utilize radiological resources in the emergency department setting.

CLINICAL RELEVANCE/APPLICATION

CT CAP is an unnecessary exam for low-velocity trauma patients with acute head/neck injury in the absence of signs or symptoms to suggest bodily injury.

SSA05-09 Effect of Timing of Request on Imaging Approach to the Diagnosis of Acute Appendicitis in a Group of Teaching Hospitals with 24/7 Availability of Ultrasound Technologist

Sunday, Nov. 29 12:05PM - 12:15PM Location: N228

Participants

Mostafa Atri, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

Hassan A. Alzahrani JR, MD, Dammam, Saudi Arabia (*Presenter*) Nothing to Disclose

Ravi Menezes, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if time of the day and day of the week influence the type of imaging request to evaluate for acute appendicitis and the performance of different modalities during and after regular hours.

METHOD AND MATERIALS

This is an REB approved retrospective study of consecutive patients operated with pre-operative diagnosis of acute appendicitis between Feb 2013 and August 2014 in three teaching hospitals with 24/7 US technologist coverage. Acquisition of consent was waived. Data collected included: a) the rate of US only, CT only and US followed by CT performed between 8AM and 5PM during the regular hours and after this period during the week, and weekend and holidays, and b) performance of each imaging approach. US examinations were all initiated by a technologist and reviewed by a staff/fellow during regular hours and by a resident/fellow after hour.

RESULTS

Three hundred and thirty seven patients were operated during this period. They included 152 women and 185 men, ranging in age from 18 to 85 (mean 36±15) years old. One hundred thirteen (33.5%) of patients were imaged before and 224 (66.5%) after regular hour ($p=0.001$). Eighteen (5.3%) had negative appendectomy, 5 (4.4%) during regular hour and 13 (5.8%) after hour ($p>0.05$), and 319 patients had appendicitis or a condition of appendix requiring surgery. Regular hour imaging included 59 (52%) US only, 32 (28%) CT only, and 22 (20%) US followed by CT. The corresponding numbers for after-hour examinations were 109 (48%), 98 (44%), 17 (8%) ($p=0.006$). Sensitivity of US during regular hour was 72% (56/78), and CT was 76% (40/53). The corresponding sensitivities for after hour examinations were 86% (101/118) ($p=0.018$) and 95% (106/111) ($p<0.001$).

CONCLUSION

In spite of comparable sensitivity of US to CT, significantly higher number of CTs was requested after regular hour to evaluate for acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

There are more CTs performed after regular hour to evaluate for acute appendicitis because of the wrong perception of lower accuracy of US being performed after regular hour.

Emergency Radiology Sunday Poster Discussions

Sunday, Nov. 29 12:30PM - 1:00PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Moderator*) Nothing to Disclose

Sub-Events

ER200-SD-SUA1 Can Postmortem CT Reliably Distinguish between Saltwater Drowning and Freshwater Drowning?

Station #1

Participants

Tomonori Murakami, Nagasaki, Japan (*Presenter*) Nothing to Disclose

Saori Akashi, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Takehiko Murase, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Takuma Yamamoto, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Kazuya Ikematsu, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The objective of this study was to clarify the difference in PMCT findings between saltwater and freshwater drownings.

METHOD AND MATERIALS

Between January 2012 and July 2014, 757 subjects underwent postmortem CT (PMCT) at our institute. Of these subjects, 37 who died of saltwater drowning (n=22) or freshwater drowning (n=15) were enrolled in this study. The cause of death was confirmed by autopsy. The frequency of typical PMCT findings of drowning (aspiration in the airway, pulmonary edema, pleural effusion, and fluid collection in the paranasal sinuses) was compared between saltwater and freshwater drownings. Based on PMCT findings, the degree of pulmonary edema and the amount of pleural effusion were categorized into three grades (mild, moderate, and severe) and assessed.

RESULTS

The incidence of PMCT findings was not statistically significantly different between saltwater and freshwater drownings: aspiration in the airway (86.4 vs. 86.7%), pulmonary edema (100 vs. 100%), pleural effusion (100 vs. 86.7%), and fluid collection in the paranasal sinuses (95.5 vs. 93.3%), respectively. The degree of pulmonary edema (mild, 2 vs. 6 subjects; moderate, 7 vs. 5; and severe, 13 vs. 4; $P=0.0213$) and the amount of pleural effusion (mild, 7 vs. 9 subjects; moderate, 8 vs. 5; and severe, 7 vs. 1; $P=0.0480$) were significantly greater in saltwater drowning than in freshwater drowning, respectively.

CONCLUSION

Although the PMCT findings of saltwater and freshwater drownings were very similar, the degree of pulmonary edema and the amount of pleural effusion on PMCT were significantly greater in saltwater drowning than in freshwater drowning.

CLINICAL RELEVANCE/APPLICATION

The degree of pulmonary edema and the amount of pleural effusion on PMCT were significantly greater in saltwater drowning than in freshwater drowning.

ER202-SD-SUA2 Identification of Unknown Body Using Forensic Imaging Between Ante-mortem Chest X-ray and Post-mortem Chest CT - Assessment of Bone Image as a Landmark for the Automatic 2D-Fusion Module Method

Station #2

Participants

Norihiro Shinkawa, MD, Miyazaki, Japan (*Presenter*) Nothing to Disclose

Ryuichi Nishii, MD, PhD, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Thi Thi Zin, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Hiroki Tamura, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Ichijo Hodaka, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Nobuhiro Yukawa, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

Toshinori Hirai, MD, PhD, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Identification of unknown deceased body has been performed mainly based on DNA profiling, fingerprinting or dental X-ray, however preparation of referred antemortem samples under controlled condition are complicated. We assess the concordance between chest postmortem CT (PMCT) and chest antemortem X-ray (AMXR) to identify unknown body. We reported that PMCT is useful to identify by fusion with AMXR using a workstation in RSNA2014. The aim of this study is to find anatomical landmarks which is more suitable for identification.

METHOD AND MATERIALS

Among 82 subjects performed PMCT in our institute from April 2010 to February 2014, 15 subjects (11 male and 4 female, 65±19 years) who underwent AMXR more than 1 year ago were enrolled in this study. To compare ray-summation of chest PMCT and

AMXR among same person and others, total of 225 tests were performed using automatic 2D-fusion module of the image analysis workstation Vincent(Fujifilm Medical System, Japan). Anatomical landmarks were placed in both 3rd and 4th rib dorsal part in the midclavicular line. The mean distance gap(mm) of each anatomical landmark between PMCT and AMXR was assessed using the module in the workstation. The parameter as mean distance gap, we compared the parameter of same person's fusion image with different persons fusion image. Furthermore, to identify unknown images, the narrowing down rate to 1-4 candidate, we examined the distribution of the parameter.

RESULTS

When employing same person's PMCT and AMXR, mean distance gap(mm) were 0.82 ± 0.30 , in contrast 1.83 ± 0.81 when employing those images of different person($P < 0.01$). This method enabled identification in 33.3% of the cases. The narrowing down rate to 2 candidates was 73.3%, to 3 candidates was 86.7%, and to 4 candidates was 100%, respectively. The narrowing down rate to 1-4 candidate was considerably improved than results when anatomical landmarks were placed in soft tissue such as tracheal sub-carina that we reported in RSNA2014.

CONCLUSION

Because the anatomical form of bones is thought to tend to be hard to change the condition between antemortem and postmortem state, Landmarks using bone-image are considered to be more suitable than those of other soft tissue like tracheal sub-carina to identify unknown deceased body using 2D-fusion module method.

CLINICAL RELEVANCE/APPLICATION

To identify the unknown deceased body, post-mortem CT was considered to be useful by comparing with ante-mortem chest X-ray.

ER203-SD- Neuro-imaging in Cancer Patients Presenting to the Emergency Department with Headache: Single SUA3 Institutional Experience

Station #3

Participants

Christopher T. Sauter, BA, Atlanta, GA (*Presenter*) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Keith D. Herr, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Saurabh Rohatgi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the preferred modality and yield of neurologic imaging in cancer patients presenting to the Emergency Department (ED) with headache.

METHOD AND MATERIALS

We conducted a retrospective analysis of patients with an active cancer diagnosis presenting to the ED with a headache over a three-year period at an academic medical center. New focal neurologic deficit was an exclusion criterion. Headache duration and quality as well as nausea and emesis were recorded.

RESULTS

90 ED visits by 84 patients (58% female, average age 56.8 ± 15) met inclusion criteria. 22/90 (24%) had a prior diagnosis of intracranial metastases (ICM), primarily from metastatic lung (10/22, 45%) and breast cancer (5/22, 23%). Initial imaging in these encounters was 19/21 (86%) non-contrast head CT (NCCT), 1/22 (5%) contrast enhanced head CT (CECT), and 2/21 (9%) contrast enhanced MRI (CEMRI). Of these exams, 15/22 (68%) were unchanged, while 6/22 (27%) had progressive ICM burden, and 1/21 (5%) was radiation necrosis versus recurrent ICM. The 68 ED visits of patients without previous ICM included leukemia/lymphoma (15/68, 22%), multiple myeloma (12/68, 18%), and breast cancer (10/68, 15%). In this subgroup, initial imaging was: 97% NCCT (66/68), 1.5% CECT (1/68), and 1.5% CEMRI (1/68). 2/68 (3%) of patients who received NCCT also received same-day CEMRI confirming no acute disease. 7/68 (10%) cases had acute findings: 2 new ICM, 2 hemorrhage, and 3 other (lytic calvarial lesions and a meningioma). Overall, 14 examinations demonstrated new findings (16%). 96% of patients without prior ICM had headache duration of less than 10 weeks, while 29% had nausea, and 15% had emesis.

CONCLUSION

NCCT dominates the imaging of headache for active cancer patients presenting to the ED. Although ACR Appropriateness Criteria recommends MRI as the preferred imaging modality for headache in cancer patients, the availability of NCCT in the ED and the yield demonstrated in our study suggest that NCCT may be the appropriate initial imaging in this specific setting. Descriptors of headache quality, previously shown to be predictive of ICM on imaging, are not routinely documented in the ED.

CLINICAL RELEVANCE/APPLICATION

NCCT may be an appropriate initial exam for cancer patients presenting to the ED with headache. Our results may be an indication to initiate discussion for revision of ACR guidelines on this subject.

ER204-SD- Unindicated Multiphase CT Scans in Non-Traumatic Abdominal Emergencies in Reproductive Age SUA4 Women: An Important Source of Unnecessary Exposure

Station #4

Participants

Caterina C. Giannitto, Milan, Italy (*Presenter*) Nothing to Disclose
Andrea A. Esposito, MD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Salvatore A. Angileri, MD, Petrosino, Italy (*Abstract Co-Author*) Nothing to Disclose
Sara Maccagnoni, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Mauro Campoleoni, BS, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Pietro R. Biondetti, MD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the frequency of unindicated multiphase CT scans and resultant excess absorbed radiation dose to uterus and ovaries in reproductive age women who underwent CT for non traumatic abdomino-pelvic emergencies.

METHOD AND MATERIALS

We examined retrospectively 116 female patients in reproductive age who underwent CT for non traumatic abdomino-pelvic emergencies from June 2012 to January 2015. We evaluated the appropriateness of each phase on the basis of clinical indication according to ACR Appropriateness Criteria and literature data. For each phase radiation dose to uterus and ovaries was calculated. The doses to uterus and ovaries were calculated with software CT-EXPO taking into consideration the Size Specific Dose Estimate (SSDE) after measuring the size of every single patient.

RESULTS

A total of 339 phases were performed in 116 female patients with a median age of 34 years (range 19-50 years). 75.8 % of patients (88 of 116) received phases that were not supported by ACR criteria and literature data. Overall, 45.4 % of phases (154 of 339) were unindicated, most commonly being unenhanced CT scans (68 of 154). The average radiation doses for each phase to uterus and ovaries were 47.1 mSv and 31.3 mSv respectively. No differences were found among different phases. The radiation doses due to unindicated phases to uterus and ovaries were 7.2 Sv and 4.8 Sv respectively, resulting in a mean excess dose of 82.4 mSv to uterus and 54.8 mSv to ovaries per patient.

CONCLUSION

In our experience, female patients in reproductive age, who underwent abdomino-pelvic CT for a non traumatic emergency, received unindicated additional phases that gave significant excess radiation dose with no associated clinical benefit. This excess of radiation could be avoid by widespread adoption of the ACR Appropriateness Criteria and literature evidence.

CLINICAL RELEVANCE/APPLICATION

The ACR appropriateness criteria help to minimize the CT radiation exposure in reproductive age women, reducing DNA damage in the germ cells that may affect fertility or cause genetic disorders in progeny.

ER201-SD- SUA5 The Largest Series of its Kind Comparing D-dimer Level and Likelihood of a Positive Pulmonary Embolism Diagnosed on Computed Tomographic Pulmonary Angiogram

Station #5

Participants

Michael W. Warren, MD, Southfield, MI (*Presenter*) Nothing to Disclose
Dominic Semaan, MD, JD, Southfield, MI (*Abstract Co-Author*) Nothing to Disclose
Edsa Negussie, MD, Farmington Hills, MI (*Abstract Co-Author*) Nothing to Disclose
Hira Irfan, MD, MBBS, Southfield, MI (*Abstract Co-Author*) Nothing to Disclose
Rani Bashiti, MD, Farmington Hills, MI (*Abstract Co-Author*) Nothing to Disclose
Alexander Croake, BA, Southfield, MI (*Abstract Co-Author*) Nothing to Disclose
Ramandeep Toor, MSc, Southfield, MI (*Abstract Co-Author*) Nothing to Disclose
Stan Naydin, BS, Fair Lawn, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pulmonary embolism (PE) is the third most common cause of cardiovascular death in the United States. The current gold standard diagnostic test is computed tomographic pulmonary angiography (CTPA). However, the risk of radiation exposure in addition to the high cost of CTPA, has led to studies evaluating whether the test is overutilized in the evaluation of a patient with suspected PE. The currently used risk estimation criteria such as Wells Criteria, Geneva Score, and PE Rule Out Criteria (PERC) may overestimate the risk, as studies have shown that PE is confirmed in only 59% to 79% of patients identified in the high risk group. Would using a higher threshold D-dimer level be helpful in decreasing the pretest probability? We present the largest review of its kind comparing D-dimer level to PE diagnosed on CTPA.

METHOD AND MATERIALS

After institutional review board approval, a retrospective analysis of 4696 patients with a (CTPA) of the chest for pulmonary embolism from September 2009-July 2013 was conducted. Of the 4696 with CTPA for PE, 1891 patients had a D-dimer level drawn within 24 hours of the exam. The D-dimer levels were subdivided into defined categories and the percentage of positive PE within those categories was calculated.

RESULTS

A Wald score demonstrated for every 1 ng/ml increase in D-dimer level, the risk of PE increased 0.1% (P value <0.01). Of the 1891 patient's with D-dimer levels, 665 were over 600 ng/ml. Of these 109 (16.4%) had a positive study for PE. For those patients with D-dimer over 600 ng/ml, the % chance of PE in the respective D-dimer ranges were: 601-1000 - 9.6 % 1001-2000 - 19.2 % 2001-3000 - 22.1 % 3001-4000 - 22.9 % > 4000 - 45 % Of those 1226 patients with D-dimer equal to or less than 600, 24 (1.9%) patients had definite acute PE on CTPA. (P Value <0.01)

CONCLUSION

Our study demonstrated a 98% negative predictive value of PE when the D-dimer is less than 601.

CLINICAL RELEVANCE/APPLICATION

When combined with other methods used to exclude PE, a D-dimer level below 600 can help the clinician to confidently exclude a PE without the use of CTPA.

ER128-ED- SUA6 MRI's Tale of Ovary Twist

Station #6

Participants

Zeena Irani, MD, MS, Tucson, AZ (*Presenter*) Nothing to Disclose
Iva Petkovska, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Bobby T. Kalb, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Christopher Geffre, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Janiel Cragun, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
James R. Costello, MD, PhD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Hina Arif Tiwari, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Ferenc Czeyda-Pommersheim, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Diego R. Martin, MD, PhD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review the relevant anatomy and pathophysiology behind ovarian torsion. 2. To illustrate potential advantages in utilizing magnetic resonance imaging (MRI) for the diagnosis of ovarian torsion, with emphasis on characteristic MRI features, improvements in accurate diagnosis, impact on therapeutic decision making and a potential reduction of additional diagnostic procedures.

TABLE OF CONTENTS/OUTLINE

1. Overview of the normal ovarian anatomy. 2. Illustrate pathophysiologic changes during ovarian torsion. 3. Technical considerations for a rapid MRI protocol will be outlined optimized for imaging in the emergency setting. 4. The imaging features of ovarian torsion will be detailed through cases with particular emphasis on the ability of MRI to accurately characterize ovarian torsion. 5. The ability of MRI to distinguish ovarian torsion will be highlighted, with comparison to conventional modalities such as ultrasound (US). 6. Examples of MRI torsion cases with surgical and pathologic correlation. 7. Examples of mimickers of ovarian torsion on MRI. 8. Summary: Recent advances in MRI facilitate rapid imaging in emergency setting. Familiarization with the MRI features of ovarian torsion holds potential for improvements in diagnostic accuracy and surgical treatment planning.

Emergency Radiology Sunday Poster Discussions

Sunday, Nov. 29 1:00PM - 1:30PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Moderator*) Nothing to Disclose

Sub-Events

ER206-SD- SUB2 Non-visualization of the Ovary on CT or US in the ED Setting: Utility of Immediate Follow Up Imaging

Station #2

Participants

Elena Motuzko, MD, Camden, NJ (*Presenter*) Nothing to Disclose
 Moazzem Kazi, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
 Maria S. Solis, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
 Ron Gefen, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In the setting of female patients in the ED receiving both a CT scan and US of the pelvis, we compared the studies to assess the association of non-visualization of the ovary with a normal correlating study and the absence of ovarian disease.

METHOD AND MATERIALS

An IRB approved, HIPAA-compliant retrospective two year review of the electronic medical record was performed. We identified adult female non-pregnant patients who received both a CT abdomen and pelvis and a transabdominal and transvaginal pelvic ultrasound within a 48 hour period through the emergency department. Imaging studies were blindly reviewed by two board certified radiologists to evaluate the ovaries in each CT and US independently. Ovaries were characterized as normal, non-visualized, or abnormal requiring follow up. All cases of non-visualized ovaries were compared to the appearance on the corresponding exam for each patient, and assessed for agreement (normal or non-visualized) or disagreement (abnormal). Statistical analysis utilizing a McNemar test with a 95% confidence interval was applied. Abnormal extra-ovarian imaging diagnoses were recorded. The EMR was used as a reference standard to assess for the presence or absence of ovarian pathology on follow up.

RESULTS

A total of 198 patients were included in the study (age range 18-75). Of these, 36 patients had non-visualization of one ovary (21 patients) or both ovaries (15 patients) on either study. On CT, 18 ovaries were non-visualized, with no cases of disagreement on US or subsequent follow up. On US, 39 ovaries were non-visualized, with three cases appearing abnormal on CT: one with an enlarged ovary and two with ovarian cysts and hydrosalpinx, none having further follow-up. Significant correlation of agreement between normal and non-visualized pairs on CT and US was observed ($P = 0.025$, McNemar). The most common abnormal imaging findings associated with non-visualized ovaries were uterine fibroids (11) and hemoperitoneum (8).

CONCLUSION

The absence of detection of the ovary on pelvic US or CT is highly associated with the lack of ovarian abnormality on follow up, and does not typically require additional imaging to exclude ovarian disease.

CLINICAL RELEVANCE/APPLICATION

The imaging work-up of women in the ED at times includes both CT and ultrasound. In detecting ovarian disease, if initial US or CT fails to visualize the ovaries, additional imaging is not needed.

ER207-SD- SUB3 Supine Chest Radiograph is Usefull Diagnostic Tool to Detect and Predict Amount of Pleural Effusion: Evaluation with MDCT Data within 1 Hour Time Difference

Station #3

Participants

Sawa Yokota, MD, Kawasaki-Shi, Japan (*Presenter*) Nothing to Disclose
 Junichi Matsumoto, MD, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Brandon D. Lohman, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Nagaharu Takakura, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Hirotaaka Ikeda, MD, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Daigo Suzuki, RT, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Kei Yokota, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
 Yasuo Nakajima, MD, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this presentation is to evaluate usefullmess of radiological findings for pleural effusion on supine chest radiograph in detecting and predicting amount of pleural effusion.

METHOD AND MATERIALS

154 pleural effusions(73 right-sided, 81 left-sided)in 85 patients older than 15 years were included. In all patients both supine chest radiographs and chest CTs were examined within an hour time difference. Patients with obvious pleural adhesion, chest tube, postoperative changes, and other pathologies were excluded. All the films were evaluated by two radiologists for the presence of

the signs of pleural effusion. The volume of pleural effusion was calculated from MDCT data. All signs on the supine chest X-ray were compared by using a receiver operating characteristic (ROC) analysis. In addition, the best cutoff value of pleural effusion for each sign was determined based on the Youden index (sensitivity + specificity - 1).

RESULTS

Area under ROC curves were more than 0.8 for basilar paraspinal hyperdensity, obliteration of medial diaphragmatic border, loss of diaphragmatic border, blunt costophrenic angle, partial obliteration of cardiac border, loss of cardiac border, and apical capping on right, and deviation of paraspinal line to left, loss of paraspinal line, obliteration of distal descending aorta, loss of descending aorta, obliteration of medial diaphragmatic border, loss of diaphragmatic border, blunt costophrenic angle, partial obliteration of cardiac border, obliteration of aortic arch, apical capping, and loss of cardiac border on left. There were tendencies to increase volume of effusion with more signs on both sides and looked to have correlation with volume and signs.

CONCLUSION

It is important to know the presence and change in volume of pleural effusion in managing severely ill patients. Supine chest radiograph is useful to detect pleural effusion and predict the amount of it. Diagnostic value can be reduced with various other disease processes but in a daily practice it is not difficult to differentiate effusion from other pathologies like atelectasis, pneumonia, and others, if you have good communications with clinicians about patients.

CLINICAL RELEVANCE/APPLICATION

Supine chest radiograph is useful not only in detecting pleural effusion but also predicting amount of it, which is very important in evaluating and managing severely ill patients with various diseases.

Combat and Forensic Radiology

Sunday, Nov. 29 2:00PM - 3:30PM Location: N230

ER

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC108A Imaging of Drug Smuggling

Participants

Ferco H. Berger, MD, Amsterdam, Netherlands, (f.berger@vumc.nl) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Comprehend the socio-economic background of drugs and the different ways of intra-corporeal transportation and packing materials used. 2) Analyze the different imaging techniques for detection of illicit drugs trafficking, detect the findings and know the potential lack thereof. 3) Comprehend with the complications that can occur and the imaging findings thereof.

ABSTRACT

The drugs industry is reported to make up to almost 1% of global GDP and 1/3 of the population has tried illicit drugs in their life. Overdosing causes a staggering estimated 1 death per hour in Europe alone. Trafficking of drugs occurs by ingestion (body packers) or vaginal/rectal insertion (body pushers). As can be imagined, ingestion / insertion of packets of drugs can cause different kinds of clinical problems, depending on packaging material and type of drug. Detection of packets by screening methods as well as acute and subacute clinical conditions and the depiction thereof by different imaging modalities will be discussed. The participants of this RC will get to know the current developments in both the packets as well as the imaging of their features and complications.

RC108B The Virtual Autopsy-Bridging Radiology and Forensics

Participants

Michael J. Thali, MD, Zurich, Switzerland, (thali@irm.uzh.ch) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To Improve basic knowledge and skills of forensic imaging for radiologists. 2) To give an update of the historical and current development and techniques in forensic imaging in the world. 3) To present the newest research areas in forensic imaging and radiology. 4) To discuss workflow and present possibilities and options. 5) To show how to get involved in forensic imaging / radiology.

ABSTRACT

The modern virtual autopsy approach (called Virtopsy) began at the turn of the millennium as multi-disciplinary applied research project to implement imaging modalities from diagnostic radiology and surveying technology in forensic sciences. Since then, the Virtopsy approach has become a standard procedure in forensic investigations. Today, computed tomography, magnetic resonance imaging, optical 3D surface scanning, and 3D photogrammetry are routinely used to detect and document forensic evidence in a minimally-invasive and observer-independent manner in both the living and the deceased. Virtopsy can enhance traditional autopsy or even replace it in selected cases. One of the main benefits of imaging lies in the observer-independent documentation of forensically relevant findings. In addition, digital imaging data can be stored permanently and may be re-examined at any time if a second opinion is required. In living patients, Virtopsy permits the documentation of patterned injuries such as bite marks, bruises, lacerations, and abrasions. Documentation is made in three dimensions, true to scale, and enables comparison of injuries to potential injury causing instruments. Virtopsy provides in the court excellent tools for crime and accident reconstruction, including 3D depictions of internal injuries, 3D true color representations of surface injuries and even 3D scaled models of entire crime scenes and events. The Virtopsy approach reproduces critical forensic evidence in an unbiased and comprehensible fashion, suitable for presentation as evidence to laypersons and legal professionals.

RC108C Medical Effects of Nuclear Weapons

Participants

Bruce R. Javors, MD, New York, NY, (bjxraydoc@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare conventional and nuclear weapons and explain their fundamental differences. 2) Comprehend the various short term effects including thermal, blast and radiation injuries. 3) Identify and understand the long term consequences of nuclear blasts especially those from radiation exposure. 4) Understand the societal disruption that may follow the use of nuclear weapons.

ABSTRACT

Since 1945 society has been faced with both the possible and real aftermaths of nuclear weapons and their use. Nuclear weapons are both quantitatively and qualitatively different from chemical explosives. Those differences will be briefly presented. Immediately after detonation, most of the energy released by a weapon is in the form of blast and heat with only a small amount of radiation produced. The former's effects on most organ systems will be reviewed along with acute radiation sickness and the resultant difficulties of shielding oneself from those effects. The delayed results of radiation exposure will also be discussed. Included are carcinogenesis and mutagenesis. Possible ecologic and social disruption will be presented. Focus will also be placed on infectious

diseases especially in light of both the diminished host and organized medical responsiveness. The myths and realities of terrorist devices, so-called suitcase bombs, will be reviewed. Appropriate video and still photographs will accompany many of the above items.

Sunday Afternoon Plenary Session

Sunday, Nov. 29 4:00PM - 5:45PM Location: Arie Crown Theater



AMA PRA Category 1 Credits™: 1.75
ARRT Category A+ Credits: 1.50

Participants

Ronald L. Arenson, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

Sub-Events

PS12A Report of the RSNA Research and Education Foundation

Participants

Burton P. Drayer, MD, New York, NY (*Presenter*) Advisor, Hologic, Inc

Abstract

The RandE Foundation - Our Future is Now This year marks the 100th anniversary of the RSNA's founding. As radiology looks toward the future, one wonders what the next 100 years will look like for our specialty and whether the central role of radiologists in healthcare will be sustained. Analogous to our clinical radiology mantra, if we are not at the radiology research table we will be on the menu. As a leading global force in radiology, the RSNA is poised to lead the specialty into the next century and exceed the incredible success of the past 100 years. The RandE Foundation will play a key role in radiology's future by continuing its support of inspiring investigators and those pursuing innovative approaches to education. To meet these research and education needs head-on, the Foundation launched Inspire-Innovate-Invest, The Campaign for Funding Radiology's Future® at last year's annual meeting. This bold campaign seeks to raise \$17.5 million to fund grants in radiologic research and education, bridging the gaps in funding for promising investigators and educators. To date our campaign has been a success with individuals, private practice and corporate donors generously pushing us to the mid-way point in our goal. There is still a long way to go. The future of our specialty depends on the commitment and generosity of each of us, the members of the imaging community. This year, the Foundation will fund 92 grants totaling \$3.6 million. The RandE is funding 25% of our ever increasing number of excellent grant applications. While pleased with these achievements, imagine what the RandE Foundation could fund with additional support from all of us as radiology colleagues? During the meeting week, please take time to visit the RandE Foundation Booth, located on Level 3 of Lakeside Center to learn more about how you can be a part of the campaign and support the RandE Foundation and the future robustness of our specialty.

PS12B Image Interpretation Session

Participants

Jonathan B. Kruskal, MD, PhD, Boston, MA (*Presenter*) Author, UpToDate, Inc

Donald P. Frush, MD, Durham, NC (*Presenter*) Nothing to Disclose

Bruce B. Forster, MD, Vancouver, BC (*Presenter*) Travel support, Siemens AG; Travel support, Toshiba Corporation;

Christine M. Glastonbury, MBBS, San Francisco, CA (*Presenter*) Author with royalties, Reed Elsevier

Michelle M. McNicholas, MD, Dublin, Ireland (*Presenter*) Nothing to Disclose

Melissa L. Rosado De Christenson, MD, Kansas City, MO (*Presenter*) Author, Thieme Medical Publishers, Inc; Author, Reed Elsevier; Author, American Registry of Pathology; Author, Oxford University Press; ; ;

Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Melissa L. Rosado De Christenson, MD - 2012 Honored Educator

Jorge A. Soto, MD - 2013 Honored Educator

Jorge A. Soto, MD - 2014 Honored Educator

Jorge A. Soto, MD - 2015 Honored Educator

Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator

Emergency Radiology Monday Case of the Day

Monday, Nov. 30 7:00AM - 11:59PM Location: Case of Day, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to Disclose
 Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Melanie Wegener, Garden City, NY (*Abstract Co-Author*) Nothing to Disclose
 Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
 Ania Z. Kielar, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
 Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
 Puneet Bhargava, MD, Shoreline, WA (*Abstract Co-Author*) Editor, Reed Elsevier
 Nicholas M. Beckmann, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Ritu Bordia, MBBS, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Recognize key imaging findings on multimodality imaging of emergency/trauma patients. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Recommend appropriate management including image-guided interventions.

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator
 Douglas S. Katz, MD - 2013 Honored Educator
 Douglas S. Katz, MD - 2015 Honored Educator
 Puneet Bhargava, MD - 2015 Honored Educator

Emergency Radiology Series: Emergency Radiology: Optimize Your Imaging

Monday, Nov. 30 8:30AM - 12:00PM Location: S102AB



AMA PRA Category 1 Credits™: 3.25
ARRT Category A+ Credits: 4.00

Participants

Meir H. Scheinfeld, MD, PhD, Bronx, NY, (mscheinf@montefiore.org) (*Moderator*) Nothing to Disclose
Aaron D. Sodickson, MD, PhD, Wayland, MA, (asodickson@bwh.harvard.edu) (*Moderator*) Research Grant, Siemens AG; Consultant, Bracco Group
Ferro H. Berger, MD, Amsterdam, Netherlands (*Moderator*) Nothing to Disclose

Sub-Events

RC208-01 Optimizing Pulmonary Embolism CT

Monday, Nov. 30 8:30AM - 8:55AM Location: S102AB

Participants

Aaron D. Sodickson, MD, PhD, Wayland, MA, (asodickson@bwh.harvard.edu) (*Presenter*) Research Grant, Siemens AG; Consultant, Bracco Group

LEARNING OBJECTIVES

1) Review the meaning of the X-ray tube output metrics CT DIvol and DLP. 2) Understand practical radiation dose reduction techniques including, among others, how tube current modulation works and is configured. 3) Demonstrate practical CT strategies to optimize CT parameters and IV contrast infusion to achieve excellent image quality at low radiation dose.

ABSTRACT

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

RC208-02 Expiratory Phase CT Pulmonary Angiography: Improving Contrast Enhancement of the Pulmonary Arteries in Failed Diagnostic Studies

Monday, Nov. 30 8:55AM - 9:05AM Location: S102AB

Participants

Joao R. Inacio, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Maha A. Al Dajani, MD, MBBS, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Katrina Newbigin, MBBS, Brisbane, Australia (*Abstract Co-Author*) Nothing to Disclose
Carolina A. Souza, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Ashish Gupta, MD, Ottawa, ON (*Abstract Co-Author*) Grant, Medtronic, Inc
Elena Pena, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Adnan M. Sheikh, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Matthew D. McInnes, MD, FRCPC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Frank J. Rybicki III, MD, PhD, Ottawa, ON (*Abstract Co-Author*) Research Grant, Toshiba Corporation;
Carole J. Dennie, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT pulmonary angiography (CTPA) is performed in end-inspiration. Non-diagnostic studies resulting from inadequate pulmonary arterial contrast opacification may be secondary to poor thoracic inflow of contrast and are routinely repeated in end-inspiration. We aimed to prospectively assess the benefit of performing the repeat study in end-expiration to obtain diagnostic studies.

METHOD AND MATERIALS

From November 2013 to April 2014, a prospective protocol was implemented to identify consecutive non-diagnostic CTPA studies due to poor pulmonary arterial contrast opacification in a tertiary center. All studies identified as non-diagnostic at the CT console by the technologist, were followed by a repeat contrast injection and image acquisition was performed in end-expiration. Measurement of pulmonary arterial attenuation and lung volumes was compared in all failed inspiration and repeated end-expiration studies (t test). A retrospective cohort of repeated CTPA studies performed in end-inspiration was compared with the prospective cohort.

RESULTS

Of 1700 consecutive CT pulmonary angiograms performed, 13 patients had a non-diagnostic inspiration study (<200HU attenuation in the MPA) and had a repeat end-expiration study. Expiratory phase CTPA studies had higher contrast enhancement in the MPA ($p < 0.001$). Expiratory studies were diagnostic (MPA >200HU) in 92% of patients (12 of 13).

CONCLUSION

End-expiration CTPA studies demonstrate significant improvement in pulmonary arterial enhancement compared to failed inspiration

studies, allowing diagnostic salvage studies.

CLINICAL RELEVANCE/APPLICATION

End-expiration CTPA studies can be used to salvage non diagnostic CTPA inspiratory studies.

RC208-03 New Contrast Injection Protocol for Dual Energy Chest CT: Does it Obviate the Need for Bolus Tracking and Arbitrary Scan Delay?

Monday, Nov. 30 9:05AM - 9:15AM Location: S102AB

Participants

Alexi Otrakji, MD, Boston, MA (*Presenter*) Nothing to Disclose
Azadeh Tabari, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Shaunagh McDermott, FFR(RCSI), Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jo-Anne O. Shepard, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Subba R. Digumarthy, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Efren J. Flores, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT pulmonary angiography (CTPA) is often triggered with bolus tracking (BT) techniques. We compared effects of bolus tracking and new fixed delay split bolus (FD-SB) contrast injection on vascular enhancement (pulmonary and aortic) and artifacts on dual energy CTPA.

METHOD AND MATERIALS

Of the 80 adult patients included in our study, 40 patients underwent CTPA using BT (4 cc/second, 370 mg%, 80-100 ml) (n= 20 patients with single energy CT(SECT): M:F 9:11, mean age 62± 11years, mean weight 75±15kg and n= 20 patients with dual energy CT(DECT) M:F 11:9, mean age 61± 15years, mean weight 76±13 kg) and 40 weight matched patients were scanned with FD-SB (M:F 21:19, mean age 62±10years, mean weight 73±16kg). In FD-SB (80ml, 370 mg%), 44ml of contrast was injected at rate of 0.6ml/second followed by 36ml contrast at rate of 1.8ml/second with DECT scanning at 100 second fixed delay. DECT was performed on dual source MDCT or single source 64-row MDCT. All exams were assessed subjectively for vascular enhancement (lobar, segmental and subsegmental pulmonary arteries, aorta, and left atrial appendage) and artifacts. HU in MPA, and CTDI vol and DLP were recorded.

RESULTS

There was no significant difference between patient weights in BT and FD-SB groups (p=0.6). CTDI vol for BT SECT: 14±6 mGy; and BT DECT: 9±1.7mGy; and FD-SB DECT: 7±0.7mGy. For FD-SD DECT, mean HU in main pulmonary arteries was 353±132HU. Optimal to excellent qualitative contrast enhancement up to subsegmental levels was seen for both BT and FD-SB examinations in 97.5% of cases (39/40) and limited in one patient (2.5%, 1/40). FD-SB DECT resulted in significantly superior enhancement in left atrium and thoracic aorta in all patients compared to all BT (SECT and DECT) (p<0.05). Contrast streak artifacts were also substantially lower on FD-SB DECT than on BT exams. Pulmonary blood volume images were uniform and superior on FD-SB DECT than on BT DECT.

CONCLUSION

Fixed delay split bolus contrast injection with DECT results in better contrast enhancement in pulmonary arteries, heart, and aorta with less contrast related artifacts as compared to bolus tracking technique for single energy- or DE-CT pulmonary angiography.

CLINICAL RELEVANCE/APPLICATION

Fixed delay split bolus DECT of the chest has the potential to replace bolus tracking CTPA for the evaluation of chest vasculature.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Subba R. Digumarthy, MD - 2013 Honored Educator

RC208-04 Dual-energy CT in the Emergency Department

Monday, Nov. 30 9:15AM - 9:40AM Location: S102AB

Participants

Savvas Nicolaou, MD, Vancouver, BC (*Presenter*) Institutional research agreement, Siemens AG

LEARNING OBJECTIVES

1) Review the basic principles of dual energy CT/Spectral imaging. 2) Discuss novel techniques implemented using dual energy CT in the acute setting including: material characterization/decomposition, bone subtraction, virtual non-contrast, iodine distribution maps, and monoenergetic spectral imaging. 3) To explain the utility of dual energy/spectral imaging in the acute care setting with examples in cardiopulmonary imaging, vascular imaging, intracranial aneurysms and stroke imaging, blunt vascular neck injuries, abdominal imaging and musculoskeletal applications.

ABSTRACT

RC208-05 Is Dual-Energy CT Pulmonary Angiography (CTPA) a Viable Alternative to Single-energy CTPA in Pregnant and Post-partum Patients? Initial Results

Monday, Nov. 30 9:40AM - 9:50AM Location: S102AB

Participants

Shaunagh McDermott, FFR(RCSI), Boston, MA (*Presenter*) Nothing to Disclose
Efren J. Flores, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Alexi Otrakji, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Subba R. Digumarthy, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Kalra K. Mannudeep, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jo-Anne O. Shepard, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare single-energy (SE) and dual-energy (DE) CT pulmonary angiogram (CTPA) protocols in pregnant and postpartum women.

METHOD AND MATERIALS

Our IRB approved study included 64 patients. Fifty patients underwent CTPA to assess for pulmonary embolism with either DE-CTPA (mean age 34 years, range 27-45; mean weight 106+49kg; mean gestation 21.5 weeks; mean postpartum 11 days) or SE-CTPA (mean age 30 years, range 19-44; mean weight 92+45kg; mean gestation 26 weeks; mean postpartum 9 days). Fourteen weight-matched non-pregnant women underwent DE-CTPA (mean age 33 years, range 22-44; mean weight 93+33kg). Scans were performed on single and dual source DECT capable CT scanners. Images were assessed qualitatively for image quality, contrast enhancement (up to subsegmental pulmonary arteries) and artifacts. CT numbers were measured in the pulmonary trunk, right and left main and lower lobar arteries. Noise was also measured in the pulmonary trunk. CTDIvol and DLP were also recorded.

RESULTS

A third (32%) of pregnant/postpartum women had limited or unacceptable SE-CTPA studies compared to just 14% limited or unacceptable DE-CTPA studies (identical to non-pregnant group undergoing DE-CTPA). Limited or unacceptable DE-CTPA occurred only in heavier patients (>190 kg) from excess noise due to application of incorrect scan parameters in these patients (80/140 kV instead of correct higher dose setting of 100/140 kV). Suboptimal SE-CTPA was noted in patients of all sizes (61-139 kg). Mean HU values of the pulmonary trunk were 588+373 HU in the DE-CTPA pregnant/postpartum group, 245+72 HU in the SE-CTPA pregnant/postpartum group ($p<0.05$). DE-CTPA in the pregnant/postpartum group was optimal for evaluation of subsegmental pulmonary arteries in 64% of patients relative to only 37% patients in the SE-CTPA group. Frequency of contrast streak artifacts on DE- and SE-CTPA was similar ($p>0.05$). The CTDIvol for DE-CTPA and SE-CTPA were 9 and 19 mGy, respectively (<0.05).

CONCLUSION

DE CTPA provides better contrast enhancement and fewer suboptimal studies compared to SE CTPA for evaluation of pulmonary embolism in pregnant or postpartum women.

CLINICAL RELEVANCE/APPLICATION

Pulmonary embolism is an important cause of morbidity and mortality in pregnant and postpartum women. DE CTPA produces better quality images when compared to SE CTPA with equal or reduced radiation in this group. Therefore, it is logical to utilize this modality whenever available.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Subba R. Digumarthy, MD - 2013 Honored Educator

RC208-06 Improved Signal and Image Quality at the Cervicothoracic Junction Using Dual-Energy CT and Monoenergetic Plus Reconstruction

Monday, Nov. 30 9:50AM - 10:00AM Location: S102AB

Participants

Dennis Parhar, BSc, Vancouver, BC (*Presenter*) Nothing to Disclose
Teresa I. Liang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Luck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Tim O'Connell, MD, Meng, Vancouver, BC (*Abstract Co-Author*) President, Resolve Radiologic Ltd; Speake, Siemens AG
Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

Attempts to reduce radiation exposure at the cervical spine are frequently and negatively limited by beam hardening artifact and photon starvation at the cervicothoracic junction. The purpose of this study is to examine whether dual-energy CT (DECT) with advanced monoenergetic (Mono+) reconstruction can reduce these artifacts and improve image quality through the cervicothoracic junction.

METHOD AND MATERIALS

In this retrospective study, 19 consecutive patients underwent DECT scanning of the cervical spine using a dual source 128-slice CT scanner (Definition FLASH, Siemens Healthcare, Germany) between February 1 and March 31, 2015. The DECT data was reconstructed using the Mono+ algorithm at five different energy levels (ranging 100 to 190 keV). Attenuation was measured at each energy level by placing regions of interest within the vertebral bodies and spinal cord. Statistical analysis of the objective data was carried out by student's t-test. Subjective analysis of image quality was conducted on a semi-objective 4 point scoring scheme by 4 radiologists. These results were subjected to a Wilcoxon Signed-Rank Test for statistical analysis.

RESULTS

Attenuation of the spinal cord at the level of C7 to T1 was significantly reduced as compared to C2 due to beam hardening. In the

Attenuation of the spinal cord at the level of C7 to T1 was significantly reduced as compared to C2 due to beam hardening. In the 100 keV reconstruction, there was a 69.9% decrease (-27.7HU, $p<0.0001$) in attenuation at C7 and 60.2% (-23.9HU, $p<0.0001$) at T1 compared to C2. However, cord attenuation substantially improved with increased energy. The maximal improvement was seen with Mono+ images reconstructed at 190 keV, where cord attenuation at C7 resulted in an increase of 61.0% (7.28HU, $p=0.0391$) over 100keV. Subjective analysis also revealed improved image quality at the cervicothoracic junction. Compared to the mixed energy scans, at 190keV, there was a significant improvement in the quality of spinal cord visualization at C7 (median =3.0, $p<0.0001$) and at T1 (median=3.000, $p<0.0001$). Beam hardening artifacts were also reduced by 44.8% ($p<0.0001$) at the C7-T1 junction.

CONCLUSION

Data derived from DECT and reconstructed using the Mono+ algorithm significantly reduces beam hardening artifacts at the cervicothoracic junction and significantly improves image quality.

CLINICAL RELEVANCE/APPLICATION

CT imaging at the cervicothoracic junction suffers from extensive artifact and noise. Due to its superior image quality, Mono+ can provide a significant benefit by improving assessment of this region.

RC208-07 Question and Answer

Monday, Nov. 30 10:00AM - 10:15AM Location: S102AB

Participants

RC208-08 Optimizing Abdominal CT Protocols and Utilization

Monday, Nov. 30 10:15AM - 10:40AM Location: S102AB

Participants

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Presenter*) Research Grant, Siemens AG; Consultant, Bracco Group

LEARNING OBJECTIVES

1) To overview the current status of emergency abdominal and pelvic CT imaging protocols. 2) To review the current literature of abdominal and pelvic emergency CT imaging protocols, with an emphasis on optimizing diagnostic information while minimizing radiation dose reduction. 3) To review areas of continuing controversy regarding emergency abdominal CT protocols.

RC208-09 Noncalcified Gallstones: Making the Invisible Visible with Dual Energy CT

Monday, Nov. 30 10:40AM - 10:50AM Location: S102AB

Participants

Jennifer W. Uyeda, MD, Boston, MA (*Presenter*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

PURPOSE

To assess whether virtual monochromatic imaging (VMI) increases the detection of noncalcified gallstones on dual-energy CT (DECT) compared with conventional polychromatic scanning.

METHOD AND MATERIALS

25 patients (20F, 5M) with noncalcified gallstones confirmed on abdominal ultrasound and/or MR were included in this IRB approved, HIPAA compliant study. All patients had a DECT on a dual-source 128x2 slice scanner (Siemens FLASH) with either 80/Sn140 or 100/Sn140 kVp pairs depending on patient size. 0.75x0.5 mm source images at high and low kVp were used for DE postprocessing (Syngo via, version VA30) using the Monoenergetic Plus application. Within 3 mm reconstructed slices, regions of interest of 0.5 cm² were placed on noncalcified gallstones and bile to record Hounsfield Units (HU) at VMI energy levels ranging from 40-190 keV.

RESULTS

Noncalcified gallstones uniformly demonstrate HU that are lowest at 40 keV and increase at higher keV. Bile HU values generally decrease at higher keV. Few of the noncalcified stones are visible at 70 keV (simulating a conventional 120 kVp scan), with measured contrast (bile-stone HU) <10 HU in 76%, 10-20 in 20%, and >20 in 4%. Contrast is maximal at 40 keV, where 100% demonstrate >20 HU difference, 75% > 38 HU difference, and 50% > 55 HU difference. A paired t-test demonstrates a significant difference ($p<0.0001$) between this stone:bile contrast at 40 keV vs 70 keV.

CONCLUSION

Low VMI energy of 40 keV increases conspicuity of noncalcified gallstones compared to conventional 120 kVp polychromatic scanning, potentially improving detection.

CLINICAL RELEVANCE/APPLICATION

DECT optimizes visualization of noncalcified gallstones, many of which are invisible on conventional 120kVp scans. This may reduce the need for further imaging for suspected cholelithiasis.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

RC208-10 Comparison of Abdominal Radiograph and Non-contrast Ultralow Dose CT for Kidney Stones

(CANUCKS Study)

Monday, Nov. 30 10:50AM - 11:00AM Location: S102AB

Participants

Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Presenter*) Speaker, Siemens AG
Ben Chew, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Jean Buckley, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
James Nugent, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
John R. Mayo, MD, Vancouver, BC (*Abstract Co-Author*) Speaker, Siemens AG
Luck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Hugue A. Ouellette, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Charles V. Zwirewich, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

At our institution, Kidney-Ureter-Bladder (KUB) radiographs are routinely performed immediately prior to shockwave lithotripsy (SWL). Conventional low dose CT-KUBs (2.2-3.0 mSv) are only performed if stones are not visible on KUB (10-15% of cases). Recent advances in integrated circuit CT detector design (STELLAR, Siemens Healthcare) and image reconstruction algorithms have made sub-millisievert ultra-low dose CT (ULDCT) acquisition feasible, but the diagnostic performance of these ULDCTs in comparison with KUB has not yet been reported. In this prospective study we compare the radiation dose and diagnostic performance of ULDCT to KUB in patients prior to SWL. We hypothesized that ULDCT will detect more symptomatic calculi than KUB at less radiation exposure prior to SWL.

METHOD AND MATERIALS

Patients enrolled in this study consented and received both a KUB radiograph and an ULDCT (32x0.6mm, 100kV, refmAs=10, pitch 1.5) prior to SWL. If no stones were identified, then a standard low dose abdominal CT was obtained. Radiation exposure parameters were recorded and both examinations were read in random order by 2 blinded radiologists to determine image quality and diagnostic accuracy.

RESULTS

102 patients (M:F, 72:32) with a mean age of 55.7 ± 13.8 y were enrolled. The effective radiation dose was 48% lower with ULDCT (0.28 ± 0.08 mSv) compared to KUB (0.54 ± 0.11 mSv, $p < 0.001$). Mean CTDIvol and DLP of ULDCT were 0.47 ± 0.26 mGy and 20 ± 12 mGy.cm respectively. The number of stones seen on both modalities was equivalent: KUB was 1.59 ± 1.27 vs 1.92 ± 0.51 for ULDCT ($p = 0.35$). However in 12 cases (12%), the ULDCT helped localize ureteral stones that were not detected on KUB. Measurement of stone size was equivalent using ULDCT (6.47 ± 3.34 mm) compared to KUB (6.98 ± 3.41 mm, $p = 0.455$). ULDCT reduced the requirement for repeat conventional dose CT-KUB and altered treatment priority of treating the ureteral stones first.

CONCLUSION

ULDCT delivers 48% less radiation than a KUB radiograph and was equivalent in detecting the number and size of stones. In 12% of cases, ULDCT identified and localized ureteric stones prior to SWL that were not seen on KUB.

CLINICAL RELEVANCE/APPLICATION

This prospective single centre study demonstrates that ULDCT is suitable to replace KUB as it delivers 48% less radiation, more frequently detects ureteric calculi and reduces the requirement for repeat conventional dose CT-KUB prior to SWL.

RC208-11 Optimizing Emergency Musculoskeletal MRI

Monday, Nov. 30 11:00AM - 11:25AM Location: S102AB

Participants

Joseph S. Yu, MD, Columbus, OH, (joseph.yu@osumc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand when to use MRI in urgent and emergent MSK conditions. 2) To optimize the types and number of sequences for urgent studies. 3) To review the use of IV gadolinium in the emergent situation.

RC208-12 Utility of a Virtual Non-contrast Dual Energy CT Algorithm for Detection of Bone Marrow Edema in Non-displaced Hip Fractures

Monday, Nov. 30 11:25AM - 11:35AM Location: S102AB

Participants

Trenton T. Kellock, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Sandra Kim, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Paul I. Mallinson, MBChB, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Tim O'Connell, MD, Meng, Vancouver, BC (*Abstract Co-Author*) President, Resolve Radiologic Ltd; Speaker, Siemens AG
Hugue A. Ouellette, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Hip fractures are associated with high disability, health care costs and mortality. The purpose of this study is to describe our experience with a dual energy CT (DECT) virtual non contrast (VNC) algorithm for detection of bone marrow (BM) edema in patients presenting to the emergency department with suspected non-displaced traumatic hip fractures.

METHOD AND MATERIALS

77 patients were identified that presented to a level one trauma center emergency department between Jan 1, 2014 and June 30,

2014, and received CT imaging due to clinical suspicion of a traumatic hip fracture. 66 underwent DECT of the hip or pelvis. Those with hip prosthesis (N=7) were excluded. Those with displaced hip fractures (N=9) were also excluded as they are not a diagnostic challenge on CT. VNC images were generated using prototype software. These were read in isolation, and then compared to standard bone reconstructions, by a staff radiologist. Both VNC and standard bone reconstruction images were graded for interpretation confidence (1-10 scale). Radiological and/or clinical diagnosis of fracture at 30-day follow up was used as the reference standard.

RESULTS

Of the 50 included patients, 8 were positive for VNC BM edema. All of these were true positives (Sn = 100%). Mean interpreter confidence of VNC images was 8.4 (range 4-10). On standard bone reconstructions, 7 of these true positives were recognized as fractures (Sn = 88%), with a mean interpreter confidence of 9.6 (range 6-10). 42 studies were negative for VNC BM edema, and all were true negatives (Sp = 100%). These were also all described as negative on the CT bone reconstructions (Sp=100%). Mean interpreter confidence was 8.3 (range 3-10) for VNC images, and 9.7 (range 6-10) for standard bone reconstructions.

CONCLUSION

Our study demonstrates that DECT VNC algorithm is an effective tool to supplement standard bone reconstructions in non-displaced traumatic hip fractures. Fractures that were subtle (or in one case not visible) on bone reconstructions all demonstrated BM edema, most with a high level of interpreter confidence. While our study is limited by a small sample size, current results suggest that DECT VNC algorithm is both highly sensitive and specific for identifying BM edema in non-displaced hip fractures.

CLINICAL RELEVANCE/APPLICATION

DECT VNC algorithm is an effective tool to supplement the interpretation of standard CT bone reconstructions in non-displaced traumatic hip fractures.

RC208-13 Dual-Energy CT for Analysis of Bone Marrow Edema in Acute and Chronic Carpal Bone Fractures

Monday, Nov. 30 11:35AM - 11:45AM Location: S102AB

Participants

Teresa I. Liang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Ismail T. Ali, MBChB, MD, Vancouver, BC (*Presenter*) Nothing to Disclose

Memoona Mian, MD, FRCR, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

Carpal bone fracture identification is often a challenging diagnosis, commonly underestimated on radiographs. CT helps to identify subtle fractures that may be radiographically occult. With the implementation of Dual Energy CT (DECT), the virtual non-calcium subtraction (VNC) technique can be applied to remove calcium to evaluate for bone marrow edema in fractures. In this study, we evaluate the utility of DECT VNC for assessment of bone marrow edema in patients with acute and chronic carpal bone fractures.

METHOD AND MATERIALS

The images of forty-seven patients between September 3, 2014 and March 9, 2015 with the suspicion of carpal bone fractures who underwent a DECT scan of their hand and wrist were reviewed by two readers using the VNC algorithm to determine the visual presence and absence of bone marrow edema in each carpal bone. The mean and standard deviation of the CT values within each carpal bone were recorded. Chi squared test and receiver operating characteristic (ROC) curve were used for statistical analysis, and $p < 0.05$ was considered significant.

RESULTS

In the 47 patients, 376 carpal bones were reviewed. 24 patients had acute (DECT-A), and 23 patients had chronic (DECT-C) carpal bone fractures. Visual analysis demonstrated that significantly more patients in DECT-A group had bone marrow edema (BME) (20/24, 83.3%) than the DECT-C group (3/23, 13.0%, $p < 0.0001$). The average CT values of the BME on the VNC images in the DECT-A and DECT-C groups were 61.6 ± 26.3 HU and 39.6 ± 26.3 HU respectively, whereas, in the non-BME carpal bones in the DECT-A and DECT-C groups, they measured -34.3 ± 27.5 HU and -24.9 ± 13.0 HU respectively. CT numbers for diagnosis of BME associated with acute carpal fractures revealed the area under the ROC curve of 0.993. An ideal cut-off value of 15.4HU for detection of BME associated with acute carpal fractures results in 100% sensitivity, 98.3% specificity, and 99.3% accuracy.

CONCLUSION

VNC DECT allows accurate visual assessment of bone marrow edema in acute carpal bone fractures. Using a cut-off of 15.4 HU provides a valid and reliable tool for detection of BME related to acute carpal bone fractures.

CLINICAL RELEVANCE/APPLICATION

Visual assessment of bone marrow edema and a quantitative cut-off of 15.4HU on VNC DECT images is useful for accurate and reliable identification of acute carpal bone fractures.

RC208-14 Question and Answer

Monday, Nov. 30 11:45AM - 12:00PM Location: S102AB

Participants

Interventional Stroke Treatment: Practical Techniques and Protocols (An Interactive Session)

Monday, Nov. 30 8:30AM - 10:00AM Location: S402AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Joshua A. Hirsch, MD, Boston, MA (*Moderator*) Shareholder, Intratech Medical Ltd

LEARNING OBJECTIVES

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

ABSTRACT

Rapid advances in the evaluation, selection, treatment and management of the acute stroke patient necessitates an ongoing educational event highlighting the newest information, techniques and strategies for obtaining the best outcomes for our patients. In this session, all of these topics will be covered in a practical 'how to' and case based approach which is designed to help the practitioner implement best practices. The course is useful for those performing imaging, treatment or both. Analysis of the latest ongoing trials, devices and techniques will be presented. Endovascular tips and tricks will be discussed, as well as pitfalls in the treatment of these patients.

Sub-Events

RC250A A Birdseye View to the Interventional Approach to Acute Stroke Therapy

Participants

Allan L. Brook, MD, Bronx, NY (*Presenter*) Advisor, Johnson & Johnson Advisor, Medtronic, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

RC250B Data, Data, and More Data: Endovascular Therapy Is the Proven Treatment for Large Vessel Occlusion

Participants

David J. Fiorella, MD, PhD, Stony Brook, NY (*Presenter*) Institutional research support, Siemens AG; Institutional research support, Sequent Medical, Inc; Research support, MicroVention Inc; Consultant, Medtronic, Inc ; Consultant, Cardinal Health, Inc; Consultant, Penumbra, Inc; Owner, Vascular Simulations LLC; Owner, TDC Technologies; Owner, CVSL; ;

LEARNING OBJECTIVES

View learning objectives under main course title.

RC250C Optimizing Patient Selection with Imaging

Participants

Ramon G. Gonzalez, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the essential ischemic stroke physiology parameters that are essential in selecting patients for endovascular treatment of a large vessel occlusion. 2) Be familiar with the imaging methods that can measure ischemic stroke physiology parameters and their relative accuracy. 3) Use the best available evidence, recognize the optimal imaging approach to select patients with acute ischemic stroke for endovascular treatment.

ABSTRACT

Properly selected patients with acute ischemic stroke caused by large vessel occlusion (LVO) may be effectively and safely treated endovascularly with modern thrombectomy devices. We have developed a high-precision imaging tool for selecting such patients. It is an experience and evidence-based clinical triage tool that uses advanced imaging to identify INDIVIDUAL patients most likely to benefit from endovascular stroke therapy. It was based on over a decade of using advanced imaging (CT, CTA, CT perfusion, DWI, MR perfusion) in acute stroke patients and a critical review of the literature and has been validated in clinical trials. The approach focuses on answering the following key questions using modern imaging: 1. Is there a hemorrhage? Noncontrast CT 2. Is there an occlusion of the distal ICA and/or proximal MCA? CTA 3. Is irreversible brain injury below a specific threshold (e.g. <70ml)? DWI Perfusion imaging is not employed unless patients cannot undergo MRI, or they do not meet the criteria for intervention. Investigations to understand the reasons for the unsuitability of perfusion CT to substitute for DWI have revealed theoretical and practical shortcomings of CTP. A major problem is the low signal-to-noise (SNR) ratio of CT perfusion that results in a poor contrast-to-noise (CNR) ratio in severely ischemic brain. In a comparison between DWI and CTP in over 50 consecutive patients with LVA, Schaefer, et al. showed that the mean CNR of DWI was >4 while it was <1 for CTP derived CBF. The poor CNR results in large measurement error: using Bland-Altman analyses it was found that the 95% confidence interval was ~+/- 50 ml for ischemic lesion volume measurements in individual patients. The Cleveland Clinic adopted a nearly identical algorithm and their results were published. They reported that after the new algorithm was adopted, there was a ~50% reduction in mortality and a ~3-fold increase in good outcomes, despite a ~50% decrease in the number of procedures. A recent prospective observational trial at the

MGH using stentriever and this imaging approach demonstrated >50% favorable outcomes (mRS 0-2) that is similar to recent randomized clinical trials. However, only 3 patients were evaluated for every patient that was treated, a screening to treatment ratio that is much lower than in recently published clinical trials.

1. Gonzalez RG, Copen WA, Schaefer PW, Lev MH, Pomerantz SR, Rapalino O, et al. The Massachusetts General Hospital acute stroke imaging algorithm: an experience and evidence based approach. *Journal of neurointerventional surgery*. 2013;5 Suppl 1:i7-12.
2. Wisco D, Uchino K, Saqqur M, Gebel JM, Aoki J, Alam S, et al. Addition of hyperacute MRI A/DWI in patient selection, decreasing the use of endovascular stroke therapy. *Stroke; a journal of cerebral circulation*. 2014;45(2):467-72.
3. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet*. 1986 Feb 8;1(8476):307-10.
4. Schaefer PW, Souza L, Kamalian S, Hirsch JA, Yoo AJ, Kamalian S, Gonzalez RG, Lev MH. Limited reliability of computed tomographic perfusion acute infarct volume measurements compared with diffusion-weighted imaging in anterior circulation stroke. *Stroke*. 2015 Feb;46(2):419-24.

Neuroradiology (Traumatic Brain Injury)

Monday, Nov. 30 10:30AM - 12:00PM Location: N226



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Pratik Mukherjee, MD, PhD, San Francisco, CA (*Moderator*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company;
Michael M. Zeineh, PhD, MD, Stanford, CA (*Moderator*) Research funded, General Electric Company

Sub-Events

SSC08-01 The Association between Football Exposure, Position, and Concussion History on White Matter Integrity

Monday, Nov. 30 10:30AM - 10:40AM Location: N226

Participants

Allen A. Champagne, BS, BA, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Michael D. Clark, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Feng Shi, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Dinggang Shen, PhD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Kevin Guskiewicz, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Diffusion tensor imaging has emerged as an important tool for quantitative analysis of white matter (WM) integrity following sport-related concussion. The primary purpose of this project was to investigate the variances in WM integrity in retired college and professional football athletes based on concussion history, duration of playing career, and playing position.

METHOD AND MATERIALS

32 former college and 31 former professional players were matched on age, concussion history, and playing position. All subjects were cognitively normal for age on a battery of neuropsychological tests. MRI scans were obtained and all diffusion-weighted images were analyzed using Tract Based Spatial Statistics. Our primary outcomes were fractional anisotropy (FA) and mean diffusivity (MD). A permuted, voxel-wise 3x2 ANOVA was performed on the WM skeleton to investigate the main and interaction effects of three fixed variables on WM integrity. These variables were concussion history (3+ vs. 0-1), football exposure (College vs. Professional), and playing position (Speed vs. Non-speed). Threshold-free cluster enhancement was used to identify clusters of significantly different FA or MD and post-hoc univariate analyses were used to determine the direction of interaction effects. Our *a priori* α was set at 0.05 after correction for multiple comparisons.

RESULTS

Three clusters in the forceps minor and genu of the corpus callosum were identified as having significant differences in FA for the concussion by position interaction. Post-hoc analysis of the peak voxels within each of the three clusters revealed consistently lower FA for non-speed players with 3+ concussions as compared to those with 0-1 concussions (Cohen's *d*: 0.89, 0.95, and 1.29; $P < 0.05$). No other main effects or interaction effects were observed for FA or MD.

CONCLUSION

Our results suggest a history of multiple concussions is associated with lower FA in former non-speed position players compared to speed players, particularly in frontal white matter tracts. Additionally, we did not observe main or interaction effects of football exposure, suggesting that without concussive injuries, added football exposure does not account for variances in FA or MD. A limitation of these results is the lack of a control group without history of football participation.

CLINICAL RELEVANCE/APPLICATION

Multiple concussions and playing a non-speed position are associated with lower FA in frontal white matter tracts.

SSC08-02 Reduced Cerebral Blood Flow Detected after Clinical Recovery in Acute Sports-related Concussion

Monday, Nov. 30 10:40AM - 10:50AM Location: N226

Participants

Yang Wang, MD, Milwaukee, WI (*Presenter*) Research Grant, Siemens AG; Research Grant, General Electric Company
Lindsay D. Nelson, PhD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Ashley A. LaRoche, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Adam Y. Pfaller, BS, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Andrew S. Nencka, PhD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Michael A. McCrea, PhD, Milwaukee, WI (*Abstract Co-Author*) Research Grant, General Electric Company

PURPOSE

Sport-related concussion (SRC) is a major health problem, affecting millions of people each year. While the clinical effects of SRC (e.g., symptoms and impairments in neuropsychological functioning) typically resolve within several days, increasing evidence suggests persistent neurophysiological abnormalities beyond the point of clinical recovery after injury. This study was aimed to evaluate cerebral blood flow (CBF) changes in acute SRC, as measured using advanced arterial spin labeling (ASL) MRI.

METHOD AND MATERIALS

We compared CBF maps assessed using 3D pCASL (pseudo continuous ASL) MRI in 18 concussed football players (age 17.8 ± 1.5 years) obtained within 24 hours and at 8 days after injury, in comparison to a control group of 19 matched non-concussed football players at the same interval. Clinical assessments including the Sport Concussion Assessment Tool 3 (SCAT3) and Standardized Assessment of Concussion (SAC) were obtained at each time point.

RESULTS

While the control group did not show any changes in CBF between the two time points, concussed athletes demonstrated a significant decrease in CBF at 8 days relative to 24 hours ($p < 0.01$, FWE corrected). Moreover, scores on the clinical symptom (SCAT3) and cognitive (SAC) measures demonstrated significant impairment (versus pre-season baseline levels) at 24 hours (SCAT $p < 0.0001$, SAC $p < 0.01$) but returned to baseline levels at 8 days.

CONCLUSION

Our preliminary results suggest that advanced ASL MRI method might be useful for detecting and tracking the longitudinal course of underlying neurophysiological recovery from concussive injury.

CLINICAL RELEVANCE/APPLICATION

Abnormal CBF was found using 3D pCASL MRI in acute concussed patients even after clinical recovery, which might have important implication for clinical decisions on return-to-play after concussion.

SSC08-03 Abnormal Radial Diffusivity Predicts Worse Cognitive Function One Year Following Concussion (Mild Traumatic Brain Injury)

Monday, Nov. 30 10:50AM - 11:00AM Location: N226

Participants

Sara B. Rosenbaum, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Namhee Kim, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Margo Kahn, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Hannah Scholl, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Jennifer Provataris, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Craig A. Branch, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Michael L. Lipton, MD, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Abnormally low FA is related to worse cognitive outcomes in concussion (mild traumatic brain injury; mTBI). Some studies demonstrate that diffusion perpendicular to the principal direction of the diffusion tensor, or radial diffusivity (RD), may largely drive changes in FA, reflecting more severe transaxonal pathology such as axotomy. The purpose of this study is to examine the relationship between regional abnormalities of RD within 2 weeks of mTBI and cognitive function 1 year later.

METHOD AND MATERIALS

31 uncomplicated mTBI subjects were recruited from a local emergency center. 3T DTI was performed within 2 weeks of injury, and cognition was tested at 1 year post-injury. Voxelwise assessment was used to identify clusters of voxels demonstrating abnormally high RD ($p(\text{individual voxel}) < 0.05$, $p(\text{cluster size corrected for multiplicity}) < 0.01$) in each subject by comparing each subject to a cohort of 40 healthy controls. Each subject was then classified according to presence or absence of abnormally high RD within the following regions: left frontal, right frontal, left temporal, right temporal and corpus callosum. T-tests were used to compare cognitive outcomes between subjects with or without abnormally high RD in each region.

RESULTS

Subjects with abnormally high RD in the left temporal and right temporal lobe performed worse on tasks of executive function at 1 year ($t(18) = -2.607$, $p = 0.018$ and $t(18) = -2.495$, $p = 0.023$, respectively). There were no significant differences in cognitive function between those with and without abnormally high RD in the frontal lobes or corpus callosum.

CONCLUSION

Abnormally high RD in the temporal lobes within two weeks of injury is significantly associated with worse executive function 1 year following uncomplicated mTBI. RD, a putative imaging correlate for transaxonal injury, may reflect more severe early axonal or myelin pathology, which heralds persistent deficits in mTBI patients.

CLINICAL RELEVANCE/APPLICATION

These preliminary findings suggest that RD might provide an early imaging biomarker for worse long-term outcomes in mTBI, to guide patient management and inform treatment trials.

SSC08-04 Diffusion Tensor MRI Reveals Gender-based Risk for Traumatic Brain Injury in Soccer Players

Monday, Nov. 30 11:00AM - 11:10AM Location: N226

Participants

Eva Catenaccio, BA, Bronx, NY (*Presenter*) Nothing to Disclose
Roman Fleysher, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Namhee Kim, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Weiya Mu, BA, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Liane Hunter, BA, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Molly Zimmerman, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Mark E. Wagshul, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Tamar Glattstein, BA, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Malka Zughaft, BA, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Walter Stewart, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

Michael L. Lipton, MD, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Female athletes are thought to be at increased risk for sports-related mild traumatic brain injury (mTBI) and worse mTBI outcomes, relative to males. Heading in soccer represents a source of repetitive subconcussive head impacts. Previous research shows that heading exposure above a threshold of approximately 1000 headers/year is associated with microstructural brain damage (lower fractional anisotropy; FA) detectable on diffusion tensor imaging (DTI). This study assesses the role of gender as a predictor of mTBI-associated changes in white matter in a cohort of amateur soccer players.

METHOD AND MATERIALS

Forty-one females and 41 age- and education-matched males (ages 18-52) were drawn from an ongoing longitudinal study of mTBI in amateur soccer players. Number of prior concussions and frequency of heading in the prior 12 months was quantified. Subjects underwent 3.0T DTI. After registration to the Johns Hopkins University template, we analyzed the results with a voxelwise general linear model with 3 predictors of interest: (1) gender to assess baseline gender differences in FA, (2) reported heading to assess heading-related declines in FA and (3) a term representing the interaction of gender and heading to assess for gender-dependent sensitivity to heading. Nuisance covariates for the analysis included age, education, and number of prior concussions. Significance was determined by a statistical threshold of $p < 0.01$ and a cluster size of 100 voxels.

RESULTS

The analysis revealed regions showing statistically significant effects from all 3 predictors of interest in the bilateral corona radiata and right frontal lobe white matter, in which (1) women had lower baseline FA, (2) where both genders showed heading-related declines in FA and (3) where there was a differential gender-based sensitivity to heading-related changes in FA.

CONCLUSION

Our finding of significant overlapping changes in white matter abnormalities may indicate that baseline sexual dimorphisms in brain microstructure are the basis for a gender-specific response to repetitive trauma. Future work should focus on associating these imaging findings with gender-specific clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Gender-based vulnerability of amateur athletes to TBI pathology, revealed through DTI, may provide new bases for the development and implementation of preventive interventions.

SSC08-05 Quantitative Assessment of Optic Nerve Injury Longitudinally Using Manganese-enhanced MRI

Monday, Nov. 30 11:10AM - 11:20AM Location: N226

Participants

Jun Yang JR, BA, Kunming, China (*Presenter*) Nothing to Disclose
Yingying Ding, MD, Kunming, China (*Abstract Co-Author*) Nothing to Disclose
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qing q. Li, Kunming, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate manganese (Mn^{2+})-enhanced MRI (MEMRI) in a longitudinal quantitative study of rat optic nerve injury.

METHOD AND MATERIALS

Forty Sprague Dawley rats were divided into 3 groups: Group A / with manganese-enhanced MRI ($n=15$), Group B / with retrograde labeled fluoro-gold and pathology ($n=15$), and control group C ($n=10$). Group A and B were underwent left optic nerve crush (ONC) at 2mm back to the eyeball. Using fluoro-gold from superior colliculus and lateral geniculate nucleus to retrograde label RGCs was performed before ONC 7days. A total of 3 mL of 90 nmol $MnCl_2$ was unilaterally injected into the vitreous body 24h before MRI. MEMRI (group A) and retinal ganglion cells (RGCs) count (group B) were performed at 3, 7 and 14 day-post-lesion (dpl). Each 5 rats in group C were underwent the same process as group A and B respectively, but no ONC. The contrast-to-noise ratio (CNR) of retina and optic nerve, the results of RGCs count were compared between groups at different time points.

RESULTS

In the control groups, the intact visual pathway, from the retina to the contralateral superior colliculus, was visualized by MEMRI. The overall impression of ONC group at the different time point (3, 7, 14dpl) after the injury was that Mn^{2+} enhancement was seen in the retina and ON proximal to the lesion site. No Mn^{2+} enhancement was observed distal to the lesion site at 3, 7 and 14 dpl. The Mn^{2+} enhanced signal was reduced from 3dpl to 14dpl in the ON proximal to the lesion site. In the ONC group at 3dpl, there was an increased Mn^{2+} signal in the ON proximal to the lesion site compared to that seen in the control group ($P < 0.05$), while no signal was detected distal to the ONC. At 7 and 14dpl, the Mn^{2+} -enhanced signal was decreased significantly in the ON proximal to the crush site, compared to the signal observed at 3dpl ($P < 0.05$). The RGCs drop rate was 6.84%, 45.31%, and 72.36% at 3dpl, 7dpl and 14dpl, respectively. The apoptosis of RGCs was most obvious after ONC at 14dpl.

CONCLUSION

MEMRI in the rat optic injury has a certain value in vivo experimental research, it can be used to observe the structure and function changes of optic nerve after injury. It is possible to detect the severity of the optic nerve by MEMRI examination.

CLINICAL RELEVANCE/APPLICATION

It is possible to use MEMRI to monitor the severity of the optic nerve injury in human by injecting micro- $MnCl_2$ in the future.

SSC08-06 'Black Dipole' or 'White Dipole': Using Susceptibility Phase Image to Differentiate Cerebral Microbleed from Intracranial Calcification

Monday, Nov. 30 11:20AM - 11:30AM Location: N226

Participants

Ying Jeng, MD, New Taipei City, Taiwan (*Presenter*) Nothing to Disclose
Chien-Yuan Lin, Taipei City, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Ai-Chi Chen, New Taipei City, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Ying-Chi Tseng, MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chi-Jen Chen, MD, Zhonghe City, Taiwan (*Abstract Co-Author*) Nothing to Disclose
David Y. Chen, MD, New Taipei City, Taiwan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of the study was to evaluate the role of susceptibility phase image in differentiation of cerebral microbleed (CMB) from intracranial calcification.

METHOD AND MATERIALS

The study was conducted upon 21 patients who received both brain CT and MRI within 3 days after acute infarct. MRI was performed in a 3T scanner, with susceptibility weighted angiography (SWAN) and susceptibility phase image generated from SWAN. Lesions that were 1) black, 2) round or ovoid, 3) less than 5 mm in SWAN were included. Two radiologists independently categorized each lesion, based on the SWAN phase image, into six axial patterns (1: total black, 2: total white 3: black with white core, 4: white with black core, 5: heterogenous black, 6: heterogenous white) and two coronal patterns (1: black dipole, 2: white dipole). Agreement of phase pattern was determined, including kappa statistics. Each lesion was interpreted as CMB or calcification based on coronal (pattern1 as CMB; 2 as calcification) and axial (pattern 1,3,5 as CMB; 2,4,6 as calcification) phase image respectively. In all the cases, CT was used as the gold standard for the presence/absence of calcification.

RESULTS

A total of 141 lesions were included. 60, 15, 17, 5, 32, 12 lesions were classified into axial phase pattern 1, 2, 3, 4, 5, 6, respectively, while 97 and 44 lesions into coronal phase pattern 1 and 2, respectively. The interobserver agreement was perfect ($\kappa = 1$) in coronal pattern, while moderate ($\kappa=0.73$; 95% CI, 0.65-0.81) in axial pattern. CT confirmed 97 lesions as CMBs and 44 as calcifications. The sensitivity and specificity for detecting calcification were 91.8% and 54.6% for axial phase image and 99.0% and 93.2% for coronal phase image. Among lesions < 2mm, the sensitivity and specificity for detecting calcification increased to 97.3% and 80.0% for axial phase image, while 88.3% and 47.1% among lesions > 2mm.

CONCLUSION

Coronal phase image better demonstrated the susceptibility property of the paramagnetic CMBs as black dipoles, which expanded along the direction of the main magnetic field, and the diamagnetic calcifications as white dipoles, with higher diagnostic accuracy than axial phase image.

CLINICAL RELEVANCE/APPLICATION

The ability of susceptibility phase image to differentiate cerebral microbleed from calcification in MRI study is gaining clinical importance, especially in patients with cerebrovascular disease.

SSC08-07 Correlation between Optic Nerve Sheath Diameter Measured Using Computed Tomography and Marshall's Scale in Adult Patients with Acute Traumatic Brain Injury

Monday, Nov. 30 11:30AM - 11:40AM Location: N226

Participants

Haider N. Al-Tameemi, MBBCh,MD, Al-Najaf, Iraq (*Presenter*) Nothing to Disclose
Sattar R. Al-Esawi, MBChB, PhD, Najaf, Iraq (*Abstract Co-Author*) Nothing to Disclose
Ali Alyassari, Al-Dywanian, Iraq (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study the correlation between ONSD measurements using CT scan with the severity of TBI according to Marshall's scoring system.

METHOD AND MATERIALS

A cross-sectional analytic study was conducted on 60 adult patients (52 males, 8 females) with acute TBI referred by the neurosurgeon for brain CT examination over period of 8 months between February 2014 and September 2014. Children (<18 years), patients with orbital pathology and orbital trauma were excluded. After initial general evaluation of brain CT images, the score of TBI was assessed according to Marshall's scale (I to VI). The transverse ONSD of both right and left sides was then manually measured on axial CT image at 3mm distance behind eye globe. Statistical analysis was done using scientific package of social statistics (SPSS) with the correlation was considered significant if P value less than 0.05. The Institutional Ethical Review Committee approved the study.

RESULTS

The means of all, right-sided and left-sided ONSD were 4.695mm, 4.606mm and 4.785mm respectively. There was statistically significant and a strongly positive linear correlation (p value <0.001, $r = 0.662$) between the mean of ONSD measured by CT scan and Marshall's score. When the ONSD measurements of the right and left sides were analyzed separately, the correlation was also significant and strongly positive (p value <0.001, $r = 0.504$ for the right side and p value <0.001, $r = 0.699$ for the left side). ONSD showed weakly negative and statistically not significant correlation (p value= 0.571, $r = - 0.075$) with the duration between onset of the trauma and time of CT examination. There was no significant difference between mean ONSD measurements when correlated with the laterality of TBI, age or gender (p values 0.392 0.328 and 0.462 respectively)..

CONCLUSION

ONSD measured on CT scan is strongly correlated with the severity of TBI as assessed by Marshall's scale. Because Marshall's scale has prognostic implication, ONSD may also have a prognostic value during assessment of patients with TBI.

CLINICAL RELEVANCE/APPLICATION

Measurement of ONSD using CT scan is correlated with higher scores of Marshall's classification of acute TBI and may be an indirect indicator of raised ICP. It is recommended to be included in the routine evaluation of patients with acute TBI.

SSC08-08 Cortical Thickness Analysis in Patients with Mild Traumatic Brain Injury

Monday, Nov. 30 11:40AM - 11:50AM Location: N226

Participants

Yadi Li, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Xiuyuan Wang, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Thomas Thesen, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Sohae Chung, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Yvonne W. Lui, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Joanne Rispoli, MD, New York, NY (*Presenter*) Nothing to Disclose

PURPOSE

It is known that brain atrophy can occur after traumatic brain injury (TBI) including changes in cross-sectional and longitudinal cortical thickness which have been documented in moderate to severe TBI patients. Alterations in cortical thickness after mild traumatic brain injury (mTBI) have not been previously examined. The purpose of this study is to investigate longitudinal changes in cortical thickness in mTBI patients from average 22 days to 1 year after injury and compare to controls.

METHOD AND MATERIALS

Sixteen patients with mTBI and 16 matched control subjects were enrolled. Longitudinal and cross-sectional cortical thickness group analysis was performed on T1WI-3D-MPRAGE images obtained at 3.0Tesla using Freesurfer. A statistical threshold of $p < 0.001$ was used following which clusterwise correction for multiple comparisons was applied. Z-score analyses were also done to assess individual differences in cortical thickness at both time-points.

RESULTS

The longitudinal analysis of mTBI subjects yielded a decrease in cortical thickness over the 1st year in the following areas: superior temporal gyrus, precentral gyrus, precuneus, etc. on the left; calcarine sulcus, parieto-occipital sulcus, inferior parietal lobule, middle occipital gyrus, etc. on the right. There was increased cortical thickness in the right temporal pole. The cross-sectional analysis showed greater cortical thickness in the mTBI group compared with normal controls at the 1st scanning in precentral gyrus, postcentral gyrus, supramarginal gyrus, paracentral gyrus, etc. bilaterally; superior temporal gyrus, middle temporal gyrus on the right; inferior temporal gyrus on the left. Right superior parietal gyrus demonstrated decrease in cortical thickness. None of these differences survive clusterwise multiple comparisons correction. Comparing to controls, Z-score analysis showed scattered differences in cortical thickness across individual patients at both 1st and 2nd scanning without definite consistent pattern.

CONCLUSION

The uncorrected pilot data suggest areas with predominantly decrease in cortical thickness of patients in the first year after mTBI; however, at the 1st scanning there is a trend towards areas of greater cortical thickness compared with controls. This could be due to a transient conformational change in regional thickness such as evolving gliosis or edema. There is, however, no clear pattern of cortical thickness change observed after multiple comparisons correction. Groupwise analysis insensitivity to morphometric alterations in this cohort may be due to heterogeneity of injury as is supported by variable differences seen after Z-score analysis.

CLINICAL RELEVANCE/APPLICATION

Cortical thickness analysis is helpful in detecting subtle morphometric changes of brain trauma.

SSC08-09 Small Traumatic Subarachnoid Hemorrhages: Is Routine ICU Admission Necessary?

Monday, Nov. 30 11:50AM - 12:00PM Location: N226

Participants

Paul J. Albertine, MD, Washington, DC (*Presenter*) Nothing to Disclose
Samuel Borofsky, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Derek Brown, MS, Washington, AR (*Abstract Co-Author*) Nothing to Disclose
Smita Patel, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Woojin Lee, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Anthony Caputy, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
M. Reza Taheri, MD, PhD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Traumatic subarachnoid hemorrhages (tSAH) are a common type of intracranial hemorrhage that occurs in the setting of acute traumatic brain injury (TBI). It is estimated that more than 1.5 million Americans suffer from a TBI per year resulting in over 300,000 hospital admissions and an estimated financial cost of 17 billion dollars. In our current clinical setting, any form of intracranial hemorrhage requires both neurological consultation and mandatory observation in an intensive care unit for close neurological monitoring. It has been suggested that the clinical impact of these small subarachnoid hemorrhages may be minimal; however, few studies exist that compare the size of a subarachnoid hemorrhage with patient outcome and rates of medical and neurological decline.

METHOD AND MATERIALS

This retrospective cohort study is based on 63 patients evaluated between 2011-2014 who presented to a Level I trauma center emergency room for acute traumatic injuries that were found to have tSAH on CT examination. Results were obtained through medical records and imaging results. Blood volumes of the subarachnoid hemorrhages were evaluated using Fisher, Modified Fisher and Claassen classification systems. Data gathered on the hospital course included several neurological and medical complications that have been associated with tSAH. Information regarding patient outcomes was based chart review.

RESULTS

Of the 63 total patients, 33 (52%) patients had low-grade tSAH which were classified as Fisher grade ≤ 2 , 40(63%) Modified Fisher grade ≤ 2 , and 41(65%) Claassen grade ≤ 2 . None of these patients with low-grade tSAH demonstrated neurological decline, medical decline, or seizures while they were hospitalized (all findings are significantly lower [$p < .05$] when compared to the patients

with higher grade tSAH). Patients with low grade tSAH had significantly shorter stays in the ICU ($p < .05$) and better clinical outcome based on GOS compared to the other patients ($p < .01$).

CONCLUSION

In this study, none of the patients with small low-grade tSAH demonstrated neurological decline, seizures, or medical decline during their hospitalization. All of these patients spent significantly less time in the intensive care unit and had good clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Patients with small low-grade tSAH rarely experience medical decline, neurological decline or seizures as a result of their injuries and may not necessitate intensive care unit admission.

Emergency Radiology Monday Poster Discussions

Monday, Nov. 30 12:15PM - 12:45PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

ParticipantsFerro H. Berger, MD, Amsterdam, Netherlands (*Moderator*) Nothing to Disclose**Sub-Events****ER209-SD- "Is CT SLIC Enough?" Parsing the Diagnostic Utility of CT and MRI using the Subaxial Cervical Spine Injury Classification (SLIC) System**
MOA1

Station #1

Participants

Daniel C. Mascarenhas, BS, Baltimore, MD (*Presenter*) Nothing to Disclose
 David Dreizin, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Uttam Bodanapally, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Deborah Stein, MD, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To definitively assess performance of CT alone vs CT and MR for determining the SLIC score and for triaging patients for surgery vs conservative management in subaxial cervical spine injuries resulting from blunt trauma

METHOD AND MATERIALS

Patients were included if they had injuries to the subaxial cervical spine, CT and MR completed within 48 hours of admission prior to surgical intervention, and sufficient clinical data to determine neurology score and definitive patient management course from chart review. 202 consecutive patients (139 case; 63 controls) from 2010-13 were reviewed by two blinded trauma radiologists. One radiologist (R1) interpreted 119 cases, the other (R2) interpreted 123 cases. 40 overlapping cases were used to determine inter-rater agreement. R1 and R2 gave SLIC score (<4 for non-surgical; 4-indeterminate; >4 for surgical) based on neurology and CT only. To minimize recall, after 4 weeks scoring was repeated with CT and MR. Diagnostic performance (Sensitivity, specificity, area under ROC curve (AUC)) and inter-rater agreement (Cohen's Kappa (K)) for both sessions was determined. One-way ANOVA was determined for DLC scores between both trials. Logistic analysis was used to determine the likelihood of the DLC score upgrading the management prediction to surgical intervention.

RESULTS

Using 4 as the cutoff value for surgical intervention (to include all patients that may potentially be surgical candidates), SLIC scoring with CT and MR combined had a sensitivity of 94.0%, specificity of 72.0%, and area-under-curve (AUC) of 0.877, with a K of 0.275. SLIC scoring with CT alone had a sensitivity of 86.2%, specificity 77.3%, and AUC of 0.877, with a K of 0.522. ANOVA found DLC scores based on MR (surgical 1.44 and non-surgical 0.623) were higher on average than DLC scores based on CT alone (surgical 1.11 and non-surgical 0.333). Two-way likelihood tests found that DLC based on MR was more likely to upgrade management prediction than DLC scores based on CT alone.

CONCLUSION

SLIC scoring with CT alone performed similarly to CT and MR, but with improved inter-rater reliability. Use of MR increases sensitivity at the expense of specificity, and increases inter-rater variability without adding to diagnostic performance

CLINICAL RELEVANCE/APPLICATION

SLIC with CT alone is equal to SLIC with CT and MR in diagnostic performance and is recommended as a fast, reliable, and accurate triage tool for traumatic subaxial cervical spine injuries

ER210-SD- MDCT with Trajectory for Penetrating Colorectal Injuries
MOA2

Station #2

Participants

David Dreizin, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
 Alexis R. Boscak, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Michael Anstadt, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Nikki Tirada, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
 Uttam Bodanapally, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Felipe Munera, MD, Miami, FL (*Abstract Co-Author*) Nothing to Disclose
 William C. Chiu, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Deborah Stein, MD, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Studies on penetrating torso trauma have focused on the utility of triple contrast MDCT for excluding surgically important injuries of any type and have had small numbers of colorectal injuries. There is limited information on the organ specific diagnostic performance of MDCT for colorectal penetrating injuries. The purpose of this blinded retrospective study was to determine a) accuracy of MDCT for colorectal penetrating injuries, and b) the roles of trajectory evaluation versus conventional signs (rectal contrast leak, collections, free air, and free fluid).

METHOD AND MATERIALS

Two trauma radiologists reviewed all penetrating torso CTs performed pre-ex lap from 2007-13 with either 40 or 64 section MDCT. Post-processing software was used to view trajectories in oblique planes (CT trajectography). Signs evaluated were: trajectory, contrast leak, collection, mural defect, hypo- or hyperenhancement of the bowel wall, wall thickening, and free fluid. Presence or absence of colorectal injury was abstracted from surgical notes by a trauma and acute care surgery fellow. Sensitivity and specificity for each sign was determined.

RESULTS

182 patients w CT before ex-lap evaluated (42 full thickness colorectal injuries and 140 controls). Rectal contrast administered in 142 (78%). Sensitivity and specificity for colorectal injury ranged from 90-97% and 81-85% respectively. For reviewer 1 (R1), trajectory was 93% sens, and 54% spec. For R2, trajectory was 90% sens, and 80% spec. Rectal contrast leak was 45-58% sens and 97-98% spec (calculated using only patients who received rectal contrast). Sens and spec for collection was 7-33% and 96-100% respectively; for free air 76-79% and 66-68%; mural defect 12-21%, and 99%; abnormal enhancement: 2-14% and 99%; thickening 83-86% and 54-67%; fluid and stranding: 75-79% and 21-25%.

CONCLUSION

Trajectory evaluation in non-standard planes has 90-93% sensitivity and therefore has the greatest utility of any sign for excluding colorectal injury. Rectal contrast leak was only 45-58% sensitive in patient receiving rectal contrast, with specificity of 97-98%. Evaluation of trajectory in combination with other signs lead to higher diagnostic performance than would have resulted from evaluating trajectory alone.

CLINICAL RELEVANCE/APPLICATION

Trajectory evaluation should be primarily but not exclusively be relied upon to exclude colorectal injury. Contrast leak was absent in a large proportion of patients with full thickness injuries.

ER211-SD- MOA3 Yield of CT Pulmonary Angiography in the Emergency Department when Providers Override Evidence-Based Clinical Decision Support

Station #3

Awards

Trainee Research Prize - Medical Student

Participants

Zihao Yan, BS, Boston, MA (*Presenter*) Nothing to Disclose

Ivan Ip, MD, MPH, Lebanon, NH (*Abstract Co-Author*) Nothing to Disclose

Ali Raja, MD, MBA, Brookline, MA (*Abstract Co-Author*) Medical Advisor, Diagonotion, LLC

Joshua Kosowsky, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Ramin Khorasani, MD, Roxbury Crossing, MA (*Abstract Co-Author*) Consultant, Medicalis Corp

PURPOSE

To determine the yield of CT pulmonary angiography (CTPA) in patients suspected of pulmonary embolism (PE) in the emergency department (ED) when providers override evidence-based Clinical Decision Support (CDS).

METHOD AND MATERIALS

This HIPAA-compliant, IRB-approved study was performed at an academic medical center ED with 60,000 annual visits and included all patients (age >16 years) suspected of PE who had CTPA from 1/1/2011 to 8/31/2013. Each CTPA order was exposed to CDS based on Well's Criteria, requiring data input (a discrete "yes" or "no" response) for each clinical attribute of Well's Criteria during the order entry process to unambiguously calculate Well's score (WS). For patients with $WS \leq 4$, CDS alerts informed providers to a. Obtain D-dimer testing before proceeding to CTPA and b. Acute PE is highly unlikely in patients with normal D-dimer value obviating the need for CTPA. Providers could ignore the CDS alerts and proceed to CTPA. For each CTPA, WS was obtained from the CDS database (Percipio, Medicalis Corp, CA) and the D-dimer value, if performed, from the EHR. We compared CTPA yield (% with positive PE) in orders where providers override CDS alerts (patients with $WS \leq 4$ with either normal D-dimer or no D-dimer testing before CTPA; our study group) with orders adherent to Well's criteria (patients with $WS > 4$, or $WS \leq 4$ with abnormal D-dimer value; our control group). To detect an 8% difference in yield from previously published data (approximately 11%) with a power of 0.8 ($\alpha = 0.05$; two-tailed test), a sample size of 167 would be needed. We used validated natural language processing tool to identify patients with positive PE supplemented with chart review in 207 randomly selected patients in our study cohort. We used Chi square for statistical analysis.

RESULTS

Out of 3063 CTPA orders, 496 had $WS \leq 4$ without D-dimer testing and 26 had $WS \leq 4$ with normal D-dimer. The yield of CTPA in the study group, $6/207 = 2.9\%$, was significantly lower than the control group, $274/2541 = 10.8\%$ ($p < 0.001$).

CONCLUSION

The yield of CTPA in the ED when providers override CDS alerts is significantly lower than when requests adhere to evidence presented in CDS. Majority of non-adherent requests avoided D-dimer testing in low risk patients.

CLINICAL RELEVANCE/APPLICATION

The low yield of CT Pulmonary Angiography when providers override Wells Criteria suggests interventions that enhance adherence to CDS alerts may be useful to reduce unnecessary imaging.

ER212-SD- MOA4 Qualitative and Quantitative Evaluation of Acute Traumatic Bone Marrow Lesions in the Knee with Dual-energy Spectral CT Imaging

Station #4

Participants

Hai-Feng Duan, MMed, Xianyang, China (*Presenter*) Nothing to Disclose

He Taiping, MMed, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

Chenwang Jin, Xi'an, China (*Abstract Co-Author*) Nothing to Disclose
Yongjun Jia, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
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Tian Xin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
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Ma Chunling, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Tian Qian, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
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Xiaoxia Chen, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the performance of virtual non-bone (VNB) images generated from dual-energy spectral CT (DEsCT) for the qualitative and quantitative diagnosis of bone marrow lesions in patients with acute knee joint trauma in comparison with magnetic resonance (MR) images.

METHOD AND MATERIALS

This prospective study had local ethics board approval, and written informed consent was obtained. 41 consecutive patients (27 men and 14 women; mean age, 36.5 ± 14.2 y) underwent DEsCT and MRI within 2 days following acute knee trauma. VNB images were generated using material decomposition with water and bone as basis material pair. MR and VNB images were graded by two blinded readers independently using a 4-point system (1=no lesion, 2=slight or mild bone marrow lesion, 3=clearly visible bone marrow lesion, 4=distinct bone marrow lesion); water density in VNB images were calculated by a third reader. MR imaging served as the reference standard.

RESULTS

For the qualitative DEsCT evaluation, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of DEsCT for depicting the distinct-grade bone marrow lesions for reader 1 (2) were 98.1% (98.1%), 85.1% (84.9%), 39.5% (39.2%), and 99.8% (99.8%), and 83.1% (82.9%), respectively with substantial inter-reader agreement ($k=0.78$). For the quantitative DEsCT evaluation, the water density for the normal region in VNB images gradually decreased from proximal to distal location ($P<0.001$). Significant differences in water density was found between regions positive for bone marrow lesions and regions that were negative ($P<0.001$). Using MRI findings as reference standard, water densities threshold values of 973.5mg/ml and 962.5mg/ml generated areas under the curve for receiver operating characteristic study of 0.996 and 0.979 for the diagnosis of distinct-graded and clear-graded bone marrow lesions in the knee, respectively.

CONCLUSION

Compared with MR images, distinct traumatic bone marrow lesions of the knee joint can be diagnosed on non-bone images reconstructed from DEsCT with high sensitivity and excellent negative predictive value, but with moderate specificity and low positive predictive value.

CLINICAL RELEVANCE/APPLICATION

distinct traumatic bone marrow lesions of the knee joint can be diagnosed on non-bone images reconstructed from DEsCT with high sensitivity and excellent negative predictive value. The patients with bone trauma can be diagnosed rapidly and accurately.

ER213-SD- CT Scan Findings Predictive of Neurological Deficits in Thoracolumbar Spine Burst Fractures MOAS

Station #5

Participants

Tae-Yong Moon, MD, PhD, Gyeongnam, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun-Jung Baek, Yang-San, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yeo-Jin Jeong, Yangsan, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

To determine reliable CT scan findings predicted to neurological deficits in thoracolumbar spine injuries.

METHOD AND MATERIALS

102 patients with thoracolumbar spine burst fractures who underwent consecutive spine 128-MDCT scan formed the study group (73 men, 29 women; average age, 50.8 years; range, 21-77 years). Neurological deficits were classified as complete with paraplegia and incomplete with either motor or sensory impairment. We analyzed 4 CT image parameters: (1) the level of main burst fracture categorized as the cord level when fracture occurred above the lower endplate of the 12th thoracic vertebral body and the cauda equina level when fracture occurred below the upper endplate of the 1st lumbar vertebra; (2) the extent of canal encroachment categorized as central canal ratios (CCRs) above 0.51 and below 0.50; (3) the degree of laminar fracture categorized as displaced fractures (Grade 3), separated fracture (Grade 2), linear fracture (Grade 1), and no fracture (Grade 0); (4) multiple vertebral fractures categorized as quadruple, triple, and double.

RESULTS

Neurological deficits were associated with cord level injuries ($p = 0.001$), CCRs below 0.50 ($p = 0.000$), displaced laminar fractures ($p = 0.000$), and multiple vertebral injuries ($p = 0.006$): Complete neurological deficit was associated with cord level injuries ($p = 0.000$) and displaced laminar fractures ($p = 0.000$); Incomplete neurological deficit was associated with CCRs below 0.5 ($p = 0.000$) and multiple vertebral injuries ($p = 0.002$).

CONCLUSION

CT scan can provide important information predicted to neurological deficits in thoracolumbar spine burst fractures.

CLINICAL RELEVANCE/APPLICATION

The CT scan can provide the information of neurological deficit in an unconscious patient.

Emergency Radiology Monday Poster Discussions

Monday, Nov. 30 12:45PM - 1:15PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Ferco H. Berger, MD, Amsterdam, Netherlands (*Moderator*) Nothing to Disclose

Sub-Events

ER214-SD- MOB1 Acute Abdomen in the Emergency Department: Is CT a Time Limiting Factor?

Station #1

Participants

David C. Wang, BSc, Toronto, ON (*Presenter*) Nothing to Disclose

Craig Parry, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

Michael Feldman, MD, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

George Tomlinson, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

Josee Sarrazin, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

Phyllis Glanc, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify and integrate key emergency department (ED) and radiology department workflow time intervals within the ED length-of-stay (LOS) for patients presenting with an acute abdomen requiring a computed tomography (CT) scan.

METHOD AND MATERIALS

An 11-month retrospective review was performed of all ED patients presenting with an acute abdomen which required an abdominal CT scan. Nine key time-points associated with ED LOS and CT workflow were collected: triage, MD assessment, CT Request, porter schedule, CT start, CT complete, provision of first CT report, ED disposition decision, and physical discharge. The median and 90th percentile times for each interval were reported.

RESULTS

Overall, 2194/2292 (96%) of ED encounters during the study period met the inclusion criteria. The median ED LOS was 9.2 hours (90th percentile: 15.7 hours). The largest individual intervals were associated with ED wait-times (median triage to physician assessment interval: 2.15 hours) and ED disposition decision (median first CT report to ED disposition interval: 2.05 hours). Median time intervals associated with CT workflow was 2.67 hours. Intervals associated with CT workflow accounted for 29% of the total LOS. Radiology turnaround-time accounted for 32% of the entire CT workflow interval. Timeline analysis demonstrated three unique patterns of ED disposition: (1) disposition after initial imaging report, (2) disposition prior to provision of imaging report, and (3) disposition prior to CT scan.

CONCLUSION

This study is the first to quantify the contribution of CT-related workflow time intervals within the context of ED LOS. ED wait-times for initial physician assessment and clinical decision making are larger contributor to LOS than CT-related workflow time intervals. We have shown that patients do not have identical ED transit pathways and this may under- or over-estimate time interval calculations. These results demonstrate the importance of site-specific ED LOS timeline analysis to identify potential targets for quality improvement as well as serve as baseline targets for measuring future quality improvement initiatives.

CLINICAL RELEVANCE/APPLICATION

First descriptive study of abdominal CT workflow time intervals within ED length-of-stay in acute abdomen presentations; established baseline targets for future quality improvement initiatives.

ER215-SD- MOB2 Colonic Wall Thickening: Iodine Quantification Using Dual Energy CT Facilitates Differentiation of Diverticulitis and Adenocarcinoma

Station #2

Participants

Kathryn Darras, MD, Vancouver, BC (*Presenter*) Nothing to Disclose

Heejun Kang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Sheldon J. Clark, BSc, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Gordon T. Andrews, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Alison C. Harris, MBChB, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Luck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG

PURPOSE

To evaluate the role of iodine quantification in differentiating colonic diverticulitis from colonic neoplasm.

METHOD AND MATERIALS

Institutional review board approval was obtained, with no informed consent required, for this retrospective analysis. 84 consecutive patients were scanned over a 6 month period, using a 128-section dual source, dual energy CT system using a standardized

protocol (100-140 kV, ref mAs of 115-89, 32x0.6mm). 42 cases of colonic wall thickening were identified. Patients who did not have a follow up colonoscopy or who had colonoscopy findings consistent with ischemia were excluded. This left 25 patients for inclusion, with colonoscopy as gold standard, 8 of whom had histopathology proven adenocarcinoma. Using the virtual non-contrast application, iodine maps and virtual non-contrast datasets were created for all patients. The coloured iodine maps were superimposed onto the virtual non-contrast images to provide both iodine distribution and anatomic detail. The iodine concentration was recorded within the thickened bowel wall using a region of interest (ROI) analysis (mg/ml). The two groups were compared using the Mann-Whitney Test.

RESULTS

The average iodine concentration was 1.89 mg/ml in bowel wall thickening due to diverticulitis and 5.31 mg/ml in bowel wall thickening due to adenocarcinoma. This difference was statistically significant ($p < 0.0001$).

CONCLUSION

Iodine concentration was more than 250% higher in patients with adenocarcinoma than in patients with diverticulitis. Iodine quantification in contrast-enhanced dual energy CT scans of the abdomen and pelvis allows for accurate quantitative distinction of colonic wall thickening due diverticulitis versus adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION

Identifying the cause of colonic wall thickening, which is generally regarded as a nonspecific CT finding, will allow for appropriate patient referral and triage for colonoscopy.

ER216-SD- Retrospective Analysis of Equestrian Related Injuries in a Rural Population MOB3

Station #3

Participants

Dawn Hrelac, MD, Charlottesville, VA (*Abstract Co-Author*) Nothing to Disclose
Michael G. Fox, MD, Charlottesville, VA (*Presenter*) Stockholder, Pfizer Inc;
James Patrie, MS, Charlottesville, VA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify injury incidence and severity, as well as the radiation dose, and total hospital charge per patient presenting to a rural Level 1 trauma center following equestrian related accidents over a 4 year period.

METHOD AND MATERIALS

A retrospective review identified 281 patients who presented to our institution for equestrian related injuries between 1/1/2010-12/31/2013. Patient demographics, mechanism of injury, types of imaging studies, approximate radiation dose administered during workup, imaging findings, injury severity (based on Injury Severity Score (ISS)), rate/length of hospitalization, and approximate healthcare expenditure were noted. Univariate and multivariate statistical analysis were performed.

RESULTS

Patient age ranged from 4-87 years (mean 38.6). Females accounted for 73.7% ($n=207$). Mechanisms of injury included fall (79.4%), kicked (10.3%) and stepped on (6.0%) by a horse. Extremity injuries were most frequent (27.4%), followed by torso (21.4%), spinal (20.6%), and head (14.6%) injuries ($p=0.007$). Increased patient age (>54 years) correlated with a $>50\%$ higher ISS and x-ray/CT/MRI usage, $>300\%$ higher median healthcare expenditure, prolonged hospital stay (4.9 v 2.1 days), 100% more spinal, and 300% more torso injuries ($p=0.001$). Fall from horse was associated with increased spinal ($\sim 5x$) and torso ($\sim 4x$) injuries, increased ISS ($>2x$), healthcare expenditure ($>6x$), and greater length of hospitalization ($p<0.005$). Mean radiation dose during workup and overall healthcare expenditure were greatest for patients >54 years of age, and for patients injured by falling from or being kicked by a horse ($p<0.04$).

CONCLUSION

Mechanism of injury and patient age represent strong predictors of injury severity, injury localization, expected healthcare expenditure, and average length of hospitalization. Patients older than 55 years who present after fall from horse tend to sustain more severe injuries, with a higher frequency of spine and torso trauma, and lengthier hospitalizations. These findings suggest that full trauma protocol workups may be most appropriate in this high risk population. Injury prevention strategies targeted towards older horse enthusiasts may reduce healthcare expenditure.

CLINICAL RELEVANCE/APPLICATION

By understanding patterns in equestrian related injury, a more tailored and evidence guided imaging work-up for these patients may be established, thereby reducing radiation exposure and healthcare expenditure.

ER217-SD- Frequency of Retrospective Use of Detector Based Dual Energy in Body CT MOB4

Station #4

Participants

Jacob Sosna, MD, Jerusalem, Israel (*Abstract Co-Author*) Consultant, ActiViews Ltd Research Grant, Koninklijke Philips NV
Michal H. Gabbai, MD, Jerusalem, Israel (*Abstract Co-Author*) Nothing to Disclose
Zimam Romman, Haifa, Israel (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Jason DiPoce, MD, Jerusalem, Israel (*Presenter*) Nothing to Disclose
Isaac Leichter, PhD, Jerusalem, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In tube-based dual-energy CT (DECT), dual-energy protocols must be prescribed in advance to select tube voltage or operate the two tubes at different kV. Spectral detector-based DECT enables retrospective reconstruction and analysis of data obtained from a single CT acquisition with no requirement to plan a dual-energy protocol in advance. The purpose of this study was to assess the frequency of the use of retrospective dual-energy CT in body imaging.

METHOD AND MATERIALS

A total of 34 patients (ages 34-89) were scanned with a novel Spectral Detector CT (SDCT) (Philips Healthcare, Cleveland, OH, USA). IRB approval and patient consent were obtained. SDCT acquisition parameters were 120 kVp and 59-259 mAs, matching our institution's routine clinical protocols. The potential use of spectral analysis based on accepted indications for DECT scanning was evaluated, and for relevant cases a decision to use spectral scanning was made in advance. This was later compared to the actual benefit of using spectral tools upon review of all 34 studies.

RESULTS

Based on the retrospective review spectral tools were used in 25 patients (73%) and in 12 (48%) of them it could not be based on the indication alone. In 15/34 (44%) patients, dual-energy use was not indicated based on the referral. However in 12 of these patients (80%) DECT SDCT data helped to achieve the diagnosis. In the other 19 patients (55%) clinical history on the study request indicated potential advantage of the use of DECT. In 13 (68%) of them it actually did. The most commonly used spectral tools were virtual monoenergy imaging in 19 patients (55%) followed by iodine maps in 13 patients (38%), effective Z imaging in 10 (29%) patients and virtual non contrast imaging (VNC) in 5 patients (14%). Types of retrospectively assessed findings included: incidental lesions (adrenal masses, stones) in 8 patients, lesion characterization (liver, pancreas, kidney) in 11 patients, artifact reduction in 4 patients and improved vessel assessment in 5 patients.

CONCLUSION

Retrospective spectral image reconstruction and analysis was used in the majority of cases and frequently offered clinical advantage even in cases where DECT was not indicated based on clinical history alone.

CLINICAL RELEVANCE/APPLICATION

Spectral detector-based dual-layer CT allows retrospective reconstruction and post-processing image analysis that may frequently be useful in clinical practice and may become an everyday tool.

Honored Educators

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Jacob Sosna, MD - 2012 Honored Educator
Jason DiPoce, MD - 2013 Honored Educator

ER218-SD- Analysing Pelvic Fracture Patterns of Trauma Patients with Active Arterial Hemorrhage MOB5

Station #5

Participants

Rollin Yu, BSC, Burnaby, BC (*Presenter*) Nothing to Disclose
Teresa I. Liang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
David Tso, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

Pelvic fractures are considered a marker of severe injury in patients with blunt trauma. The most serious problem associated with these pelvic fractures is arterial hemorrhage, which remains the leading cause of death. The purpose of this study is to look for pelvic fracture patterns associated with pelvic arterial hemorrhage in trauma patients.

METHOD AND MATERIALS

Thirty-eight consecutive trauma patients who presented to our Level-one Trauma center with pelvic fractures from 2009-2013 were reviewed retrospectively from the Trauma Database. Half of the patients (19/38) had pelvic fractures identified on CT or plain film, and pelvic bleeding as shown by contrast extravasation on WBCT exam, requiring subsequent embolization. The remaining patients (19/38) had pelvic fractures on CT or plain film, but with no evidence of pelvic bleed. Their pelvic fracture patterns and Young-Burgess classifications were documented, to review any contingencies with pelvic bleeding. Fischer's exact test was used to determine the p-value from a contingency table, and $p < 0.05$ was considered significant.

RESULTS

We found a significant association between bilateral fractures of both superior and inferior pubic rami and the presence of pelvic arterial hemorrhage ($p = 0.029$). Surprisingly, the various Young-Burgess fracture classification patterns did not show any significant association with pelvic bleeding. Furthermore, fractures involving other anatomical structures, including the presence of sacral fractures, iliac wing fractures, and acetabular fractures did not show significant correlation with active pelvic bleed ($p = 0.69, 0.48$, and 0.18 respectively).

CONCLUSION

Although the Young-Burgess classification sheds light on the mechanism of pelvic traumas, its usefulness may be limited in predicting pelvic bleeds. Instead, the presence of bilateral fractures of both superior and inferior pubic rami demonstrates a significant association with pelvic arterial hemorrhage. However, we recognize the limitations of a small sample size and plan to expand it in the future to add more power to the study.

CLINICAL RELEVANCE/APPLICATION

In the setting of trauma patients with bilateral fractures of both superior and inferior pubic rami, suspicion for a pelvic arterial hemorrhage should remain high and an extensive evaluation should be performed.

SSE04

Cardiac (Acute Chest Pain in the Emergency Department Patient)

Monday, Nov. 30 3:00PM - 4:00PM Location: S504AB



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Karen G. Ordoñas, MD, San Francisco, CA (*Moderator*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Moderator*) Spouse, Medical Director, F. Hoffmann-La Roche Ltd
Karin E. Dill, MD, Evanston, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSE04-01 Added Value of the Triple-Rule-Out Study versus Dedicated Coronary CTA for the Evaluation of Chest Pain in the Emergency Department: Review of a 10-Year Experience

Monday, Nov. 30 3:00PM - 3:10PM Location: S504AB

Participants

Amelia Whorowski, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Ethan J. Halpern, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Triple-rule-out (TRO) CT examines the coronaries, aorta and pulmonary arteries in a single scan. Compared to coronary CTA (cCTA), TRO CT includes anatomic structures above the carina and requires contrast opacification of both right and left sided circulations. The purpose of this study is to determine the added value of TRO CT for evaluation of chest pain in the emergency department.

METHOD AND MATERIALS

All TRO studies performed at our institution from 2006 to 2015 were reviewed. Scans were performed on a 256 slice iCT (Philips Medical Systems), using ECG-gating and a biphasic injection with 60 mL of Optiray 350 followed by 60 mL of a 1:1 mixture of contrast and saline. Scans extended from just above the aortic arch through the base of the heart. Reports were reviewed for diagnoses that could explain chest pain and significant incidental findings.

RESULTS

There were 1196 total cases. Four were excluded for inadequate image quality. 651 patients (54.6%) were female. Average age was 51 years. 81.4% of patients could be safely discharged without a significant coronary or non-coronary diagnosis. 139 patients (11.7%) had significant coronary artery disease (50% stenosis or greater) while 106 patients (8.9%) had a non-coronary diagnosis that could explain chest pain ($p < 0.02$), including pulmonary embolism (28 cases), aortic aneurysm (24) and other aortic pathology (10). 30 cases of pulmonary embolism and aortic pathology would not have been detected with cCTA because of unopacified right sided circulation or limited z-axis coverage. Even if cCTA opacified both right and left sided circulations, 4 patients had segmental upper lobe emboli alone, which would not have been included in the cCTA scan. 418 patients (35.1%) had a total of 528 incidental findings not felt to explain chest pain.

CONCLUSION

Although TRO CT identified a greater number of coronary versus non-coronary diagnoses to explain chest pain, 8.9% of patients had an unsuspected non-coronary explanation for chest pain, and 30/106 of these non-coronary diagnoses would have been missed on dedicated cCTA. Thus, TRO CT adds value in the evaluation of acute chest pain, particularly in the identification of significant non-coronary diagnoses.

CLINICAL RELEVANCE/APPLICATION

TRO CT can identify non-coronary diagnoses in acute chest pain patients and is appropriate when there is suspicion for acute coronary syndrome along with other diagnoses, such as pulmonary embolism.

SSE04-02 Incidence of ACS, MACE, and Positive ICA after Acute Chest Pain cCTA in Real World Clinical Practice-A Clinical Registry Comparison versus Published Trials

Monday, Nov. 30 3:10PM - 3:20PM Location: S504AB

Participants

Sumbal A. Janjua, MD, Boston, MA (*Presenter*) Nothing to Disclose
Pedro V. Staziaki, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Harshna V. Vadvala, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Sean B. Singer, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Phillip Kim, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose
Tomas Neilan, MD, Boston, MA (*Abstract Co-Author*) Consultant, GlaxoSmithKline plc
Udo Hoffmann, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brian B. Ghoshhajra, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Multiple randomized controlled trials have established the safety and efficacy of coronary CT angiography (cCTA) in evaluating low-to intermediate risk emergency department (ED) patients with acute chest pain. However, concerns have been raised that results may vary outside the confines of a trial setting. We report our initial clinical experience at a large-volume tertiary center, and compare the results to published trials.

METHOD AND MATERIALS

We included all consecutive ED patients presenting with acute chest pain undergoing cCTA between October 2012 and July 2014. Medical records were reviewed and adjudicated for acute coronary syndrome (ACS) during index hospitalization and for major adverse cardiac events (MACE) at up to 60 days after discharge. ACS was defined as myocardial infarction (MI) and unstable angina pectoris requiring hospitalization (UAP) while MACE included MI, UAP and urgent coronary revascularization. We also determined the positive predictive value (PPV) of cCTA (defined as the rates of invasive coronary angiography (ICA) confirming >50% luminal narrowing). Results were compared with the published results of the ROMICAT II, ACRIN-PA and CT-STAT trials.

RESULTS

399 patients with a mean age of 51 \pm 11 years were included. The rate of ACS was 9.5% (n: 38/399), the rate of MI: 1% (n: 4/399) and UAP: 8.5(34/399). The rates of ACS were comparable to other published randomized trials. The rate of ICA was 6.2% (n: 25/399) with 92% (n: 23/25) of ICA confirming stenosis >50% by cCTA (PPVof cCTA) as compared to a PPV of 76.9% in CT-STAT, 76% in ACRIN PA and 78% in ROMICAT II. There were no undetected ACS and 60-day MACE rate after negative cCTA was 0%, with 0.25% MACE overall (n: 1/399; in a patient with severe stenosis managed medically), in keeping with other published trials.

CONCLUSION

Our unrestricted clinical registry confirmed similar rates of ACS and MACE to large randomized published trials. There were no undetected ACS nor MACE after negative cCTA. The positive predictive value of cCTA for ICA stenosis >50% was 92%, slightly higher than published randomized trials.

CLINICAL RELEVANCE/APPLICATION

An ED cCTA clinical registry confirms similar rates of ACS and MACE compared to large published trials, reinforcing the effectiveness of cCTA in an acute chest pain population.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Udo Hoffmann, MD - 2015 Honored Educator

SSE04-03 Radiation Exposure of Acute Chest Pain Coronary CTA at a Tertiary Center Versus Recently Published Studies

Monday, Nov. 30 3:20PM - 3:30PM Location: S504AB

Participants

Pedro V. Staziaki, MD, Boston, MA (*Presenter*) Nothing to Disclose
Harshna V. Vadvala, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
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Jonathan A. Scheske, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Nandini M. Meyersohn, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Udo Hoffmann, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brian B. Ghoshhajra, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Coronary CT angiography (CCTA) accurately stratifies patients with acute chest pain into low or increased risk of infarction, allowing rapid disposition from the emergency department (ED). We report the radiation doses of emergency department (ED) CCTAs in a tertiary center and compare them with recent studies.

METHOD AND MATERIALS

We included all consecutive ED patients with acute chest pain that presented for CCTA between October 2012 and January 2015. We compared the mean estimated effective doses of our registry patients versus the published MonashHEART, San Antonio Military Medical Center, ROMICAT II, and CT-STAT studies.

RESULTS

Our registry comprised 629 patients. Prospective ECG-triggering utilized in 91% of cases; median tube potential was 100 kV (80-120 interquartile range); mean estimated effective dose was 4.5 \pm 2.9 mSv; and median estimated effective dose was 3.7 (2.4-5.7) mSv. MonashHEART reported 585 patients with a mean estimated effective dose of 6.4 \pm 2.8 mSv. San Antonio study reported median 6.7 (4.9-9.1) mSv. ROMICAT II reported 473 CCTA patients with a mean cumulative dose for all patients of 11.3 \pm 5.3 mSv, whereas in the subset of 78 patients who underwent 128-slice dual source CCTA (identical to our site's equipment) dose was 6.2 \pm 3.8 mSv. CT-STAT reported 361 patients, with a median cumulative estimated effective dose of 11.5 (6.8-16.8) mSv.

CONCLUSION

Radiation exposure at CCTA can be decreased in ED patients versus larger trials, with our site noting a median effective dose of 3.7 (2.4-5.7) mSv. This was likely due to increased use of prospective ECG-triggering and tube potential lowering.

CLINICAL RELEVANCE/APPLICATION

CCTA is reliable to assess coronary disease in the setting of acute chest pain. Efforts are made to decrease radiation exposure, including prospective ECG-triggering and tube potential lowering.

Honored Educators

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Udo Hoffmann, MD - 2015 Honored Educator

SSE04-04 Discharge Times of Emergency Department Patients Evaluated with Coronary CT Angiography: Effect of Observation Unit Utilization and Hours of Scan Availability

Monday, Nov. 30 3:30PM - 3:40PM Location: S504AB

Participants

Nandini M. Meyersohn, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pedro V. Staziaki, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Harshna V. Vadvala, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Thomas Mayrhofer, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
John T Nagurney, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Udo Hoffmann, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brian B. Ghoshhajra, MD, Boston, MA (*Presenter*) Nothing to Disclose

PURPOSE

Recent trials have established that the use of coronary CT angiography (CCTA) to evaluate low- to intermediate risk emergency department (ED) patients with acute chest pain leads to shorter discharge times for those without significant coronary artery disease (CAD). Emergency departments are increasingly utilizing observation units (EDOUs) to address issues of health care cost and ED overcrowding. We evaluated the effect of hours of scan availability and utilization of an EDU on disposition times of patients without significant CAD.

METHOD AND MATERIALS

684 total ED patients were referred for CCTA between October 2012 and March 2015. 134 patients were excluded, 116 (17%) with significant CAD (>50% luminal stenosis) and 18 (3%) admitted as inpatients. The remaining 550 patients without significant CAD were subdivided into three groups. Group 1 included 301 patients scanned October 2012 - June 2014 with "banker's hours" of scan availability from 8am-3pm non-holiday weekdays only on a hospital-based scanner. Group 2 included 57 patients scanned July 2014 - September 2014 with "extended hours" of availability from 8am-7pm weekdays and 8am-12pm weekends and holidays on a hospital-based scanner. Group 3 included 192 patients scanned September 2014 - March 2015 with "extended hours" but on a scanner newly located physically in the ED. EDU utilization and time from triage to discharge was compared.

RESULTS

281 patients (51%) were discharged directly from the ED and 269 (49%) via an EDU. Statistical analysis was made using Wilcoxon rank sum test and reported as median values with interquartile range (Figure 1). Time to discharge did not increase significantly in either group with increased hours of scan availability. Discharge times for patients treated in an emergency department observation unit were significantly longer than those treated in the emergency department only.

CONCLUSION

Regardless of hours of scan availability or physical location of scanner, nearly all ED patients without significant CAD evaluated with CCTA were discharged within 24 hours of triage. Utilization of an ED observation unit, however, significantly increased time to discharge.

CLINICAL RELEVANCE/APPLICATION

Nearly all ED patients without significant CAD evaluated with CCTA are discharged within 24 hours of triage, although utilization of an ED observation unit significantly increases time to discharge.

Honored Educators

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Udo Hoffmann, MD - 2015 Honored Educator

SSE04-05 A System Dynamics Model Analysis to Assess the Impact of CCTA for Chest Pain Patients on Overall ED Performance

Monday, Nov. 30 3:40PM - 3:50PM Location: S504AB

Participants

Alexander Goehler, MD, PhD, New Haven, CT (*Presenter*) Nothing to Disclose
Steffen Huber, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Felix T. Nautsch, MS, BA, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
John T Nagurney, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
G. Scott Gazelle, MD, PhD, Boston, MA (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Marval Biosciences Inc
Udo Hoffmann, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hannah J Wong, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Coronary computed tomographic angiography (CCTA) improves triage efficiency of patients with acute chest pain; however its impact on the Emergency Department (ED) performance for non-cardiac patients is unknown.

METHOD AND MATERIALS

We reviewed two consecutive years of ED visits at our tertiary care hospital to identify chest pain visits with chest pain suspicious for ACS but without known CAD who were suitable for CCTA. To determine the impact of CCTA on the ED, we identified our comparator group to be all non-cardiac patients who were placed in observation status. We developed a System Dynamics model to simulate patient flow through the ED, incorporating patient's characteristics, imaging use, and daily/hourly trends in ED visit volumes. The model considered two strategies (1) Standard of care as observed at our institution and (2) CCTA triage after 1st negative Troponin and discharge of patients without CAD on CCTA. Different CCTA availabilities were considered.

RESULTS

:Among 9,400 patients who received serial troponin measurements to assess chest pain in the ED, we identified 3,594 visits (38%) eligible for CCTA (age: 56±15 years, 52% male), accounting for 24% of all observation admissions. 3% of the patients were ultimately diagnosed with ACS. 52% of the patients with negative serial troponin had further CAD workup, among which 16% had obstructive CAD. The comparator cohort included 8,848 ED visits (age: 55±19 years, 47% male). 23% required cross-sectional CT imaging including head (37%), abdominal/pelvis (21%), and CTA-PE (8%). The model predicted well the length of stay (LOS) (model vs. observed in hours) for the current standard of care (target: 21 vs. 19, comparator: 22 vs. 25). The LOS was reduced to 14.8 hours (29%) when CCTA was available 24/7 and 10.8 (48%) when it was available M-F 7AM-4PM. At the same time, observation unit capacity for non-cardiac patients was increased by 7% and 11%, respectively

CONCLUSION

About one third of all ED visit for chest pain could benefit from a CCTA work up. This would not only reduce the length of stay for cardiac patients but also increase capacity for non-cardiac patients, improving overall ED performance.

CLINICAL RELEVANCE/APPLICATION

To our knowledge, this is the first study to assess CCTA in the broader ED context beyond the impact on cardiac patients.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Udo Hoffmann, MD - 2015 Honored Educator

SSE04-06 Culprit Lesions of Acute Coronary Syndrome are Characterized by the Presence of Stenosis and High-risk Plaque, But Not Higher Segmental Coronary Artery Calcium Score: Results from the ROMICAT II Trial

Monday, Nov. 30 3:50PM - 4:00PM Location: S504AB

Participants

Stefan Puchner, MD, Boston, MA (*Presenter*) Nothing to Disclose
Thomas Mayrhofer, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jakob Park, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael T. Lu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pal Maurovich-Horvat, MD, PhD, Budapest, Hungary (*Abstract Co-Author*) Nothing to Disclose
Khristine Ghemigian, BA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jerome Fleg, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Udo Hoffmann, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Maros Ferencik, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The amount of coronary artery calcium (CAC) predicts cardiovascular events and correlates with plaque burden. However, CAC may represent advanced stage of atherosclerosis and is not directly related to high-risk plaque. We determined the association of stenosis, high-risk plaque and segmental CAC score with culprit lesions of ACS.

METHOD AND MATERIALS

We studied 501 patients with acute chest pain from the coronary CT angiography (CCTA) arm of the ROMICAT II trial. CCTA was assessed for the presence of $\geq 50\%$ stenosis and high-risk plaque (positive remodeling, low HU plaque, napkin-ring sign, spotty calcium) in all 17 coronary segments. Total and segmental CAC Agatston score was measured on non-contrast CT scans. Culprit lesions were determined in subjects with ACS by the review of available records.

RESULTS

Subjects with ACS (n=37) had higher prevalence of $\geq 50\%$ stenosis (78% vs. 7%, $p < 0.001$) and high-risk plaque (95% vs. 59%, $p < 0.001$), and higher total CAC score [median 229, 25th-75th percentile 75-517 vs. 27, 25th-75th percentile 0-99]. High-risk plaques were more frequent in segments with lower segmental CAC score (Figure, $p < 0.001$). In subjects with ACS, culprit (n=41) vs. non-culprit (n=200) plaques had higher prevalence of $\geq 50\%$ stenosis (81% vs. 11%, $p < 0.001$) and high-risk plaque (76% vs. 51%, $p = 0.005$), but not higher segmental CAC score (median 22, 25th-75th percentile 4-71 vs. 14, 25th-75th percentile 0-51; $p = 0.37$). In multivariable multilevel mixed-effects logistic regression, $\geq 50\%$ stenosis (OR 40.2, 95%CI 15.6-103.9, $p < 0.001$) and high-risk plaque (OR 3.4, 95%CI 1.3-9.1, $p = 0.02$), but not segmental CAC score (OR 1.0, 95%CI 1.0-1.0, $p = 0.47$) were associated with culprit lesions of ACS.

CONCLUSION

Prevalence of high-risk plaque is inversely related to segment amount of CAC. Culprit lesions of ACS are characterized by $\geq 50\%$ stenosis and high-risk plaque, but not by higher segmental CAC. These findings suggest that local advanced calcification may represent more stable stage of atherosclerosis, while the culprit lesions are characterized by smaller amounts of CAC.

CLINICAL RELEVANCE/APPLICATION

High calcium score indicates a higher risk for acute coronary syndrome, however the culprit lesions are characterized by smaller

amounts of coronary artery calcium.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Udo Hoffmann, MD - 2015 Honored Educator

SSE06

Emergency Radiology (Emergent Musculoskeletal and Spine Imaging)

Monday, Nov. 30 3:00PM - 4:00PM Location: N227



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Sujit Vaidya, MD, London, United Kingdom (*Moderator*) Nothing to Disclose

Bharti Khurana, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

SSE06-01 CT for Thoracic and Lumbar (T- and L-) Spine Fractures: Can CT Findings Accurately Predict Posterior Ligament Complex (PLC) Disruption?

Monday, Nov. 30 3:00PM - 3:10PM Location: N227

Participants

Bharti Khurana, MD, Boston, MA (*Presenter*) Nothing to Disclose

Luciano M. Prevedello, MD, MPH, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

Heidi Miracle, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Erwin Lin, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Steven T. McCormack, MD, Weston, MA (*Abstract Co-Author*) Nothing to Disclose

Christopher M. Bono, MD, Boston, MA (*Abstract Co-Author*) Advisory Panel, UnitedHealth Group; Royalties, Wolters Kluwer nv;

Mitchell A. Harris, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

PURPOSE

To test the ability of secondary CT findings in patients with T- and L- spine fractures to predict disruption of the posterior ligament complex, a crucial determinant of fracture instability.

METHOD AND MATERIALS

105 consecutive ER patients with thoracic or lumbar spine fracture (fx) who had both CT and MRI from 2008-2012 were included. A composite gold standard was based on disruption of any PLC component by MRI or intraoperative exam findings. 3 blinded readers (2 neuroradiology trained emergency radiologists and 1 spine surgeon) graded CT scans for: VBT vertebral body translation/rotation, FJD facet joint subluxation/dislocation, FJW facet joint widening, FPL facet/pedicle/lamina fx, SPF spinous process fx, ISW interspinous distance widening, PEF posterior endplate corner fx. Analysis included interobserver agreement, and univariate and multivariate logistic regressions (performed separately by reader) to test associations between CT findings and gold standard PLC disruption (PLCD).

RESULTS

53 of the 105 patients had PLC disruption by gold standard. Interobserver agreement (averaged across reader pairs) was good for all CT findings, ranging from 92% for VBT to 72% for ISW. In univariate analysis, the strongest predictors of PLCD were FPL (OR 3.9-5.2, $p < 0.001$ for all readers) and ISW (OR 1.8-3.1, all $p < 0.05$). SPF and VBT showed significant results for 2/3 readers. PEF was not associated with PLCD. The overall presence of at least one of the CT findings had 70% average interobserver agreement, and OR 5.4-8.1 (all $p < 0.002$) for PLCD, with sensitivity 75-90%, specificity 37-63%. Multivariate regression analysis showed similar results, with FPL as the most predictive individual CT finding, with sensitivity 30-57%, specificity 75-92%.

CONCLUSION

Several secondary CT findings can substantially increase suspicion for PLC disruption, with any abnormal CT finding increasing the odds of disruption by 5.4 or greater across all readers.

CLINICAL RELEVANCE/APPLICATION

Close attention to secondary CT findings in patients with T- or L- spine fractures may help radiologists predict PLC disruption and expedite appropriate management.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Bharti Khurana, MD - 2014 Honored Educator

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

SSE06-02 Accuracy of the NEXUS-criteria for CT

Monday, Nov. 30 3:10PM - 3:20PM Location: N227

Participants

R. S. Smit, MD, Almelo, Netherlands (*Presenter*) Nothing to Disclose

Jb Egbers, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose

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J. J. van Netten, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose

D. van der Velde, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose
M Kraai, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose
J. op den Akker, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Purpose: The NEXUS-criteria** are validated criteria to identify adult patients who need conventional radiography of the cervical spine after blunt trauma. Despite the fact that CT is internationally seen as the 'golden standard' when cervical spine injury is suspected, the NEXUS-criteria have never been validated for CT. We tested the accuracy of the NEXUS-criteria for CT with simultaneously implementation of the Dutch guidelines for blunt trauma (CBO, 2009) of the cervical spine after high-energy trauma.
**Hoffman et al. NEJM 2000:94-99

METHOD AND MATERIALS

Methods: A retrospective observational study in the period January 1st 2012 to December 31st 2013, including all patients aged 15 years and older with a high-energy-trauma (HET). We evaluated the NEXUS-criteria against the outcome of a fracture or no fracture of the cervical spine determined by CT.

RESULTS

Results: A total of 875 patients were included, from which 599 patients had a positive- and 276 patients had a negative NEXUS-screening. In the group with the positive NEXUS-criteria 35 fractures were found. One patient with a negative NEXUS-screening had a fracture. This leads to a sensitivity of 0,972 (95% CI: 0,837-0,998) and a negative predictive value of 0,996 (95% CI: 0,976-0,999) of the NEXUS criteria.

CONCLUSION

Conclusion: The NEXUS-criteria have a good sensitivity as well as a good negative predictive value for CT of the cervical spine when injury of the cervical spine is suspected in patients with a high-energy-trauma aged 15 years and older.

CLINICAL RELEVANCE/APPLICATION

Daily practice at the emergency room.

SSE06-03 Comparison of Radiation Dose-equivalent Radiography, Multidetector Computed Tomography and Cone Beam Computed Tomography for Fractures of the Wrist

Monday, Nov. 30 3:20PM - 3:30PM Location: N227

Participants

Jakob Neubauer, MD, Freiburg, Germany (*Presenter*) Nothing to Disclose
Carolin Reidelbach, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Elmar C. Kotter, MD, MSc, Freiburg, Germany (*Abstract Co-Author*) Editorial Advisory Board, Thieme Medical Publishers, Inc
Mathias F. Langer, MD, PhD, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose
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Johannes M. Voigt, Giessen, Germany (*Abstract Co-Author*) Nothing to Disclose
Sebastian Goerke, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic quality of radiography, to radiography equivalent dose multidetector computed tomography (RED-MDCT) and to radiography equivalent dose cone beam computed tomography (RED-CBCT) for wrist fractures in phantoms.

METHOD AND MATERIALS

As phantoms we chose 10 cadaveric hands from body donors. Distal radius, distal ulna and carpal bones were artificially fractured in a random order. Radiation dose was calculated with Monte Carlo simulations. RED-MDCT and RED-CBCT scans of the wrist were performed with the same radiation dose as combined dorsopalmar and lateral radiographs of the wrist. The gold standard was evaluated by a combination of fracturing protocol and high-dose MDCT. 3 independent raters evaluated the images for fractures, joint involvement and fracture displacement. Raters scored the certainty of their findings on a 5-point Likert Scale. Statistical analysis was performed with calculation of pooled sensitivity, pooled specificity and receiver operating characteristic (ROC). Interrater correlation for all modalities was evaluated by Kendall's coefficient of concordance W. False discovery rate was controlled according to Benjamini and Yekutieli.

RESULTS

Pooled sensitivity for fractures was 87% for RED-MDCT, 78% for RED-CBCT and 58% for radiography, being significantly different only between RED-MDCT and radiography ($P=0.01$). Although sensitivity for joint involvement and fracture displacement was higher in RED-MDCT and RED-CBCT compared to radiography, these differences were not significant. No significant differences were detected concerning the modalities' specificities. Raters' certainty was higher in RED-MDCT and RED-CBCT compared to radiography ($P<0.001$). The area under the ROC curve for fracture detection was higher for RED-MDCT and RED-CBCT compared to radiography, although this was significant only for one of the three raters. Interrater correlation was 0.93, 0.87 and 0.94 for radiography, RED-MDCT and RED-CBCT, respectively.

CONCLUSION

In this study, the diagnostic quality of RED-MDCT and RED-CBCT for wrist fractures proved to be similar and in some parts even higher compared to radiography.

CLINICAL RELEVANCE/APPLICATION

RED-MDCT and RED-CBCT scans have a sufficient potential to improve the diagnostic quality for wrist fractures without raising radiation dose and should be tested in a clinical setting.

SSE06-04 Diagnosis of Acute Fractures of the Thoracic Spine Using Bone Marrow Edema Detected by Dual-Energy CT

Participants

Dennis Parhar, BSc, Vancouver, BC (*Presenter*) Nothing to Disclose
Teresa I. Liang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Ismail T. Ali, MBChB, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

The assessment of bone marrow edema is limited in conventional CT. Dual-energy CT (DECT) with virtual non-calcium (VNCA) images allows subtraction of bone mineral to better reveal the fluid attenuation of bone marrow. The purpose of this study is to describe our clinical experience with DECT VNCA images for the detection of bone marrow edema in acute fractures of the thoracic spine.

METHOD AND MATERIALS

In this retrospective study, 397 thoracic vertebral bodies from 36 consecutive patients were assessed for the presence of bone marrow edema in acute fractures. Each of these patients underwent DECT of the thoracic spine (100kV-Sn140kV, 255refmAs, 40x0.6mm) using a dual source 128-slice CT scanner (Definition FLASH, Siemens Healthcare, Germany) between November 9, 2014 and March 31, 2015. The DECT data was post-processed using a 3-tissue algorithm to create VNCA images on a multimodality CT workspace. Each vertebral body was independently evaluated by two readers for the presence or absence of abnormal bone marrow edema on greyscale and color-coded maps. Attenuation of each of the vertebral bodies was then obtained. This data was then subjected to receiver operating characteristic (ROC) curve analysis to determine the sensitivity, specificity, and accuracy of using bone marrow edema to diagnose acute fractures of the thoracic spine.

RESULTS

Vertebrae positive for acute fracture demonstrated a statistically significant increase in the attenuation of abnormal bone marrow edema (114.2 ± 15.06 HU in acute fractures compared to -2.118 ± 1.699 HU in non-fractures, $p < 0.0001$). Inter-observer agreement for the presence of abnormal bone marrow edema was excellent ($k = 0.865$). The ROC analysis of the CT attenuation values demonstrated an area under curve (AUC) of 0.987 with an optimal cutoff value of 43.5 HU. This resulted in a sensitivity of 100%, specificity of 93.8%, and an accuracy of 92.9% for detection of acute fractures of the thoracic spine.

CONCLUSION

Findings from this study show that bone marrow edema and using a cut-off value of 43.5HU in virtual non-calcium images reconstructed from dual-energy CT can be useful in the diagnosis of acute fractures of the thoracic spine.

CLINICAL RELEVANCE/APPLICATION

Virtual non-calcium images derived from DECT allow detection of bone marrow edema and, therefore, provide a convenient and accurate modality for detection and characterization of acute fractures.

SSE06-05 Diagnostic Value of CT in Patients with Suspected Thoracic Spine Fractures Due to Minor Trauma

Monday, Nov. 30 3:40PM - 3:50PM Location: N227

Participants

Murat Karul, MD, Hamburg, Germany (*Presenter*) Nothing to Disclose
Amelie Hoffmann, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Jin Yamamura, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the accuracy of biplane radiography in the detection of thoracic spine fractures in patients with minor trauma using computed tomography (CT) as the reference.

METHOD AND MATERIALS

130 consecutive patients (71 males; 59 females; mean age 69 ± 22.7 years; range 18-95 years) with minor trauma of the thoracic spine and low to moderate back pain on physical examination were included retrospectively. All had undergone biplane radiography first, followed by a CT scan in a time frame of 4 days because of aggravation of their symptoms. A contingency table and the Chi-square test (X^2) were used to compare both diagnostic methods.

RESULTS

CT revealed 95 fractures in 71/130 patients (54.6%). Most fractures were diagnosed in the thoracolumbar junction ($n = 27$). Biplane radiography was true positive in 42/130 patients (32.3%), false positive in 20/130 patients (15.4%), true negative in 42/130 (32.3%), and false negative in 26/130 patients (20%), showing a sensitivity of 61.8%, a specificity of 67.7%, a positive predictive value of 67.7%, and a negative predictive value of 61.8%. None of the fractures missed on biplane radiography was unstable. Presence of a fracture on biplane radiography was highly statistically significant, if this was simultaneously proven by CT ($X^2 = 11.3$; $p = 0.00077$).

CONCLUSION

Sensitivity and specificity of biplane radiography in the diagnosis of thoracic spine fractures in patients with minor trauma are low.

CLINICAL RELEVANCE/APPLICATION

Considering the wide availability of CT that is usually necessary for taking significant therapeutic steps, indication for x-ray in minor trauma patients should be very restrictive.

SSE06-06 140kVp Spectral Filtration CT of the Cervical Spine: Reduced Artifact and Reduced Radiation Dose in the Emergency Setting

Participants

Dennis Parhar, BSc, Vancouver, BC (*Presenter*) Nothing to Disclose

Luck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Tim O'Connell, MD, Meng, Vancouver, BC (*Abstract Co-Author*) President, Resolve Radiologic Ltd; Speake, Siemens AG

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG

PURPOSE

Attempts to reduce radiation exposure at the cervical spine are frequently and negatively limited by beam hardening artifact and photon starvation at the cervicothoracic junction. The purpose of this study is to compare image quality and radiation dose of conventional 120kVp CT versus a novel spectral filtration CT (SFCT) mode, which uses 140kVp and an added tin filter to produce small quantities of highly penetrating photons, in acute trauma patients.

METHOD AND MATERIALS

20 consecutive patients underwent SFCT of the cervical spine (Sn140kV, 450refmAs, 40x0.6mm) using a dual source 128-slice CT system (Definition FLASH; Siemens Healthcare, Forchheim, Germany) and were compared to 20 patients who underwent conventional 120kVp CT. Attenuation was measured by placing circular regions of interest on the spinal cord at the C2, C5, and C7 levels. Statistical analysis of this data was performed using Mann-Whitney U tests. Image quality was graded by 2 readers using a semi-objective 4-point scoring system at the same spinal levels. These results were subjected to Wilcoxon Signed-Rank Test for statistical analysis.

RESULTS

The findings show a statistically significant decrease in the radiation dose when using SFCT versus conventional 12-kVp CT. SFCT reduced the computed tomography dose index (CTDI) by 47.4% (-12.5, $p < 0.0022$) and the dose length product (DLP) by 43.3% (-246.7, $p < 0.0022$). Moreover, subjective analysis of image quality demonstrated a statistically significant improvement in image quality at both the C5 and C7 level due to reduction of bone hardening artifact (median=3, $p < 0.0313$).

CONCLUSION

The findings show a significant objective decrease in radiation dose as well as a significant subjective improvement in image quality through reduction of bone hardening artifact in spectral CT versus conventional CT. These results indicate that spectral filtration CT shows great promise in imaging of the cervical spine.

CLINICAL RELEVANCE/APPLICATION

Given the large number of C-Spine imaging referrals, a young patient base, and the potentiality of serious injury, there is a necessity for high-quality, reduced-dose C-Spine imaging in the ER setting

SSE18

Neuroradiology (Stroke and Recovery)

Monday, Nov. 30 3:00PM - 4:00PM Location: N229



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

David J. Mikulis, MD, Toronto, ON (*Moderator*) Stockholder, Thornhill Research Inc; Research Grant, General Electric Company;
Pina C. Sanelli, MD, Manhasset, NY (*Moderator*) Nothing to Disclose

Sub-Events

SSE18-01 **Magnitude of Predictive Error When Employing ASPECTS Methodology for Core and Penumbra Estimation Towards Diagnosis and Prognostication in Acute Ischemic Stroke: A Paradigm Challenge of Imaging-Based Approaches to Therapy Selection**

Monday, Nov. 30 3:00PM - 3:10PM Location: N229

Participants

Meredith Bowen, BA, Atlanta, GA (*Presenter*) Nothing to Disclose
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Deqiang Qiu, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Jian Kang, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Fadi Nahab, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Emerging treatment strategies in acute ischemic stroke (AIS) propose CTP-derived therapy selection paradigms; however, speed and availability of non-contrast CT may compel fast, qualitative approaches to risk stratification using ASPECTS. The superiority of rigorous automated approaches has been recently reported, although the magnitude of potential error in estimating core and putatively at-risk volumes using qualitative approaches remains unknown. We proposed the analysis of prediction error towards core and penumbral volumes using qualitative approaches, hypothesizing broad ranges across potential values, with greatest vulnerability to error using NCCT ASPECTS

METHOD AND MATERIALS

54 patients (36 female, 71 years+/-16) with anterior circulation AIS imaged with NCCT and CTP were evaluated. Perfusion analysis (time ~2.5 min) was performed in an operator independent environment (RAPID). Estimated core infarct volume was calculated by relative CBF. At-risk volume was calculated at Tmax>6s. NCCT and CTP ASPECTS were determined by two independent evaluators. Linear regression models were fitted with each of the volume variables as outcome and qualitative scores as covariates. F-statistics of ANOVA were performed.

RESULTS

Demographics included median NIHSS=16 (IQR 15), mean time to imaging=233min (IQR 252). Mean (sd) volumes for rCBF core for NCCT-ASPECTS scores 8-10 were 27(31.6), 11.2(17.8), 4.7(7.8), respectively (p<0.001), while at-risk volumes at Tmax>6s were 68.3(30.9), 56.4(55.4), 44.2(42.1) (p=0.36). For CBV-ASPECTS scores 7-10, rCBF volumes were 12.2(23), 5.1(9.4), 0(0), 0(0) (p=0.004), while at-risk volumes, Tmax>6s were 42.2(28.7), 44.3(34.6), 17.1(26.7), 47.1(56.1) (p=0.04). For CBF-ASPECTS scores 7-10, rCBF volumes were 17.6(30.5), 5(10), 0(0), 3.2(4.5) (p=0.05), while at-risk volumes, Tmax>6s were 40.4(20.8), 44.5(40), 17.1(26.7), 15.7(12.7) (p=0.07).

CONCLUSION

ASPECTS is widely reported as a quick approach to risk stratification and treatment selection in AIS, but tissue changes may lag hypoperfusion and irreversible injury. While not practical as an estimation of at risk tissue, the present study further challenges the feasibility of such approaches as predictors of irreversible core at presentation.

CLINICAL RELEVANCE/APPLICATION

Qualitative methods are prone to wide ranges of core and at-risk tissue volume for any one appearance in AIS; fast, comprehensive image triage may be advisable for therapy choice, risk stratification.

SSE18-02 **Detection of Small Vessel Occlusions Using a Wavelet-based CT Angiography Reconstructed from CT Perfusion Data in Acute Ischemic Stroke**

Monday, Nov. 30 3:10PM - 3:20PM Location: N229

Participants

Wolfgang G. Kunz, MD, Munich, Germany (*Presenter*) Nothing to Disclose
Lukas Havla, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
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Olaf Dietrich, PhD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Kolja M. Thierfelder, MD, MSc, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Birgit B. Ertl-Wagner, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate a newly developed wavelet-based CTA (waveCTA) reconstructed from whole-brain CT perfusion (WB-CTP) data in stroke patients in which conventional single-phase CTA (spCTA) failed to demonstrate a vessel occlusion.

METHOD AND MATERIALS

Out of a retrospective cohort of 658 consecutive patients who had undergone multiparametric CT due to suspected stroke, we included all patients with the following inclusion criteria: (1) CT perfusion deficit as assessed by CBF, (2) no evidence of occlusion in spCTA, and (3) acute ischemic non-watershed infarction as confirmed by follow-up MRI or CT within 72hrs. waveCTA images were calculated from whole-brain CT perfusion data after initial rigid-body motion correction using the wavelet transform (Paul wavelet, order 1) of each pixel attenuation time course, from which the angiographic signal intensity was extracted as the maximum of the wavelet power spectrum. waveCTA was analyzed by two blinded and experienced readers with respect to presence and location of vessel occlusions and detail visibility of vessels in comparison to spCTA.

RESULTS

Sixty-three patients (9.6%, mean age 74.8 yrs, range 34-89) fulfilled the inclusion criteria. waveCTA reconstruction was successful in all patients. Overall, in 31 (49.2%) of these patients with negative spCTA, an occlusion could be identified using waveCTA. In the subgroup of 48 MCA infarctions, 24 occlusions (50.0%) were detected by waveCTA, mainly located on the M2- (12) and M3-level (10). A subgroup of ACA and PCA infarctions with 6 patients each demonstrated occlusions using waveCTA in 3 cases each. Detail visibility of small vessels (M2-4 level) was rated significantly higher for waveCTA vs. spCTA (4.5 vs. 2.8; $p < 0.001$).

CONCLUSION

Wavelet-based CT angiography reconstructed from CT perfusion data allows the detection of small vessel occlusions that are missed by spCTA in around 50% of the cases.

CLINICAL RELEVANCE/APPLICATION

waveCTA is a promising new angiographic reconstruction technique of WB-CTP data that improves the sensitivity in the detection of small-vessel occlusions. Further studies on the prognostic value of these occlusions may contribute to clinical decision making in acute ischemic stroke.

SSE18-03 Effects of Radiation Dose Reduction in Volume Perfusion CT Imaging of Acute Ischemic Stroke

Monday, Nov. 30 3:20PM - 3:30PM Location: N229

Participants

Ahmed E. Othman, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Carolyn Brockmann, MD, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose
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Martin Wiesmann, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To examine the influence of radiation dose reduction on image quality and sensitivity of Volume Perfusion CT (VPCT) maps regarding the detection of ischemic brain lesions.

METHOD AND MATERIALS

VPCT data of 20 patients with suspected ischemic stroke acquired at 80 kV and 180 mAs were included. Using realistic reduced-dose simulation, low-dose VPCT datasets with 144 mAs, 108 mAs, 72 mAs and 36 mAs (80%, 60%, 40% and 20% of the original levels) were generated, resulting in a total of 100 datasets. Perfusion maps were created and signal-to-noise-ratio (SNR) measurements were performed. Qualitative analyses were conducted by two blinded readers, who also assessed the presence/absence of ischemic lesions and scored CBV and CBF maps using a modified ASPECTS-score.

RESULTS

SNR of all low-dose datasets were significantly lower than those of the original datasets ($p < .05$). All datasets down to 72 mAs (40%) yielded sufficient image quality and high sensitivity with excellent inter-observer-agreements, whereas 36 mAs datasets (20%) yielded poor image quality in 15% of the cases with lower sensitivity and inter-observer-agreements (Figure)).

CONCLUSION

Low-dose VPCT using decreased tube currents down to 72 mAs (40% of original radiation dose) produces sufficient perfusion maps for the detection of ischemic brain lesions.

CLINICAL RELEVANCE/APPLICATION

The application of LD-CTP is associated with lower patient radiation exposure while maintaining high diagnostic accuracy for the detection of ischemic brain lesions.

SSE18-04 Comparing Different Imaging Strategies in Acute Ischemic Stroke

Monday, Nov. 30 3:30PM - 3:40PM Location: N229

Participants

Omar N. Kallas, MD, New York, NY (*Presenter*) Nothing to Disclose
Jana Ivanidze, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Ajay Gupta, MD, New York, NY (*Abstract Co-Author*) Research Consultant, Biomedical Systems; Research support, General Electric Company

Pina C. Sanelli, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of our study was to compare two different imaging strategies in acute ischemic stroke: using Noncontrast CT (NCCT) versus CT Angiography and Perfusion (CTAP) as the first imaging modality after patient presentation. Our hypothesis is that using CTAP as the first imaging modality may correlate with better outcomes compared to NCCT depending on patient characteristics of age, NIHSS and time from symptom onset to presentation.

METHOD AND MATERIALS

In this institutional review board-approved retrospective study, 373 patients with acute ischemic stroke who presented within a one year period at two large institutions were enrolled in this study. Inclusion criteria included presentation within 8 hours of stroke symptom onset, and no evidence of hemorrhage on initial imaging study. Patients were divided into two groups: those who received NCCT and those who received CTAP as their first imaging study. Patients were subsequently stratified based on treatment strategy (no treatment, Intravenous tPA (IVTPA) treatment, and endovascular therapy), and sub-stratified based on age, NIHSS, and time to from symptom onset to presentation. Outcomes of mRS scores were compared between groups to determine the best imaging strategy based on patient characteristics.

RESULTS

Among the patients who were eventually treated with IVTPA, patients who received CTAP as their first imaging study had significantly lower mRS scores compared to those who received NCCT first ($p < 0.001$). This difference in mRS scores was seen in the subgroup of patients greater than 70 years old, with NIHSS greater than 5, and who presented within 4.5 hours of symptom onset. There was no significant difference in outcomes between the two imaging strategies in patients who did not receive treatment at all, and those who only received endovascular therapy.

CONCLUSION

In those patients who were eventually treated with IVTPA, significantly better outcomes were observed in patients who underwent CTAP as their first imaging study compared to those who received NCCT first (the current imaging standard). In patients greater than 70 years of age, with NIHSS greater than 5 and presenting within 4.5 hours of symptoms onset, CTAP may better inform physicians as to subsequent treatment strategy.

CLINICAL RELEVANCE/APPLICATION

Imaging strategies for ischemic stroke patients should be individualized based on patient characteristics of age, NIHSS and time from symptom onset to presentation.

SSE18-05 Dynamic Grey Matter Changes during Motor Recovery after Pontine Infarction: A Voxel-based Morphometry Study

Monday, Nov. 30 3:40PM - 3:50PM Location: N229

Participants

Peipei Wang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yi Shan, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Tianyi Qian, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Chengxu Li, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Shasha Zheng, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Miao Zhang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xiuqin Jia, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Qingfeng Ma, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jie Lu, MD, PhD, Beijing, China (*Presenter*) Nothing to Disclose
Kuncheng Li, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the neural mechanisms of motor recovery after pontine infarction, we explored changes of grey matter within motor cortex by voxel-based morphometry (VBM) analysis method and calculated the correlations between the thickness of grey matter of each voxel and clinical scores.

METHOD AND MATERIALS

Fifteen stroke patients with unilateral infarction of pontine area were scanned and neurologically assessed 5 times after the stroke (within 3~7 days, at 2 weeks, 1 month, 3 months, and 6 months after stroke onset). All patients underwent MPRAGE scans on a Siemens Magnetom Trio 3.0T scanner. Fifteen age-sex with left and right handed matched healthy participants were also examined with the same protocol. The gray matter volume changes after infarction were assessed using VBM and motor deficits were evaluated with Fugl-Meyer Motor Scale (FMMS) score at the same time. The correlation between gray matter changes, infarction volumes and FMMS scores were respectively analyzed.

RESULTS

The FMMS significantly increased progressively from the seventh day to the sixth month after infarction ($P < 0.05$). In pontine group, GMV were increased in putamen, pallidus, frontal gyrus, temporal gyrus, inferior parietal lobule, and occipital gyrus, which mostly located in the contralateral. And GMV were decreased in frontal gyrus, postcentral gyrus, precuneus, caudate culmen, and uvula. The results of group analysis showed that there was no significant change in normal control group between different time point. While, in stroke group the GMV showed increase in ipsilateral thalamus within 7 days compared to 3 month and 6 month. Comparison between two groups at each time point, we found that the volume of contralateral inferior parietal lobule increased continually, however, ipsilateral precuneus showed decrease of GMV during the study period. The changes of GMV in the contralateral putamen and pallidus were positive correlated with the changes in the FMMS of stroke patients ($r = 0.287$, $p = 0.012$); Changes in ipsilateral postcentral was negative correlated with changes in FMMS ($r = -4.20$, $p = 0.000$).

CONCLUSION

The existence of gray matter volume increased, and spontaneous with motor recovery in patients with pontine infarction is closely related to brain plasticity.

CLINICAL RELEVANCE/APPLICATION

Our findings provide imaging evidences that reveal the motor function recovery mechanisms after cerebral infarction.

SSE18-06 A Correlation Study between Diffusivity of Ischemic White Matter Fiber Tract and Neuro-functional Recovery in Patients with Acute Stroke by Using DTI Technique

Monday, Nov. 30 3:50PM - 4:00PM Location: N229

Participants

Shuohui Yang, MD, Shanghai, China (*Presenter*) Nothing to Disclose
Fang Lu, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Jiang Lin, MD, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Ruixin Cheng, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Qiong Zhu, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Songhua Zhan, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the correlation between diffusivity of ischemic white matter fiber tract and neuro-functional recovery in acute stroke patients by using DTI, and try to predict motor outcome of these patients.

METHOD AND MATERIALS

Forty unilateral cerebral ischemic patients with motor dysfunction underwent MRI and DTI study within 3 days after the onset of illness. MRI scans were done 1, 2 and 3 month after treatment. Fractional anisotropy (FA) and apparent diffusion coefficient (ADC) maps were obtained. With the reference of DW images, regions of interest (ROIs) were selected on the ischemic white matter fiber tract, and the control ROIs were selected on the contra-lateral homonymic tract. The ratios of FA and ADC (rFA and rADC) within these ROIs and infarction volume (IV) were calculated. The relationship between DTI parameters with IV and national institute of health stroke scale (NIHSS) scores were assessed. According to motricity index (MI), a total of 32 stroke follow-up patients after one year were divided into no motor deficit group and motor deficit group; DTI parameters were used to predict the motor outcome.

RESULTS

Significant differences were found regarding rFA, rADC and IV of ischemic white matter fiber tract among the onset, 1, 2 and 3 month of acute stroke patients ($F = 13.84$, $P = 0.00$, $F = 64.57$, $P = 0.00$ and $F = 37.41$, $P = 0.00$). There was significantly negative correlation between rFA and NIHSS scores at the onset and 1 month ($r = -0.59$, $t = -4.59$, $P = 0.00$, $r = -0.34$, $t = -2.27$, $P = 0.02$) and between rADC and NIHSS at the onset ($r = -0.44$, $t = -3.04$, $P = 0.00$). There was significantly positive correlation between rADC and NIHSS scores ($r = 0.28$, $t = 1.83$, $P = 0.04$, $r = 0.39$, $t = 2.69$, $P = 0.00$, $r = 0.63$, $t = 4.99$, $P = 0.00$) and between IV and NIHSS ($r = 0.4$, $t = 2.73$, $P = 0.01$, $r = 0.44$, $t = 3.05$, $P = 0.00$, $r = 0.32$, $t = 2.13$, $P = 0.04$) at 1, 2, and 3 month from the onset. There was significant correlation between the rADC of 3 month and MI of 32 stroke patients after one year ($t = 2.75$, $P = 0.01$) with AUC of ROC being 0.905.

CONCLUSION

There could be a significant correlation between the change of diffusivity of the ischemic white matter and the neuro-functional recovery in acute stroke patients by analyzing DTI metrics. rADC at 3 month after onset may be used to predict the motor outcome.

CLINICAL RELEVANCE/APPLICATION

ADC values of DTI at 3 month after onset of stroke patients may be used to predict the motor outcome.

MSCT22

Case-based Review of Thoracic Radiology (An Interactive Session)

Monday, Nov. 30 3:30PM - 5:00PM Location: S100AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Diana Litmanovich, MD, Haifa, Israel (*Director*) Nothing to Disclose

Sub-Events

MSCT22A Airway Disorders

Participants

Diana Litmanovich, MD, Haifa, Israel (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the current imaging technique for evaluating of airway disorders in adult population, with an emphasis on radiation dose reduction. 2) Learn important clinical aspects and characteristic imaging features (both static and dynamic) of various airways abnormalities . 3) Discuss key imaging findings which allow differentiation among various airway disorders, as well as alternative imaging modalities such as thoracic MRI.

ABSTRACT

MSCT22B Pulmonary Arteries and Aorta

Participants

Charles S. White, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

To review pathology of the pulmonary arteries and aorta, focusing on cross-sectional imaging.

MSCT22C Thoracic Civil and Military Trauma

Participants

John P. Lichtenberger III, MD, Bethesda, MD, (john.lichtenberger@usuhs.edu) (*Presenter*) Author, Reed Elsevier

LEARNING OBJECTIVES

1) Incorporate up-to-date epidemiological understanding of thoracic trauma into clinical practice. 2) Identify key imaging features of thoracic trauma in modern civilian and military settings with an emphasis on those features which alter clinical management. 3) Describe the pathogenesis of blast lung injury, its imaging appearance and prognosis.

ABSTRACT

Thoracic trauma is a key component of clinical practice, and radiological evaluation of trauma patients is integral to their surgical management. The medical understanding of civilian thoracic trauma has historically been informed by experiences in military combat. In turn, the development of modern imaging technology in the civilian sector has revolutionized triage and operative planning of trauma patients in both civilian and military settings. This complex interplay between civilian and military trauma care continues today, particularly with the advent of urban warfare. One example of the applicability of military thoracic trauma to the civilian sector is blast injury, a hallmark of modern combat trauma that has increased significantly in the civilian developed world. Most radiologists will care for thoracic trauma patients in medical treatment facilities equipped with modern imaging and surgical capabilities in a civilian setting and with civilian patterns of injury. However, in addition to conventional trauma radiology, exposure to modern combat-specific trauma cases will continue the educational and mutually beneficial interaction between civilian and military trauma medicine and ultimately benefit patient care.

Emergency Radiology Tuesday Case of the Day

Tuesday, Dec. 1 7:00AM - 11:59PM Location: Case of Day, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to Disclose
 Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Ritu Bordia, MBBS, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Melanie Wegener, Garden City, NY (*Abstract Co-Author*) Nothing to Disclose
 Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
 Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Ania Z. Kielar, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
 Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
 Puneet Bhargava, MD, Shoreline, WA (*Abstract Co-Author*) Editor, Reed Elsevier
 Nicholas M. Beckmann, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Recognize key imaging findings on multimodality imaging of emergency/trauma patients. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Recommend appropriate management including image-guided interventions.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator
 Douglas S. Katz, MD - 2013 Honored Educator
 Douglas S. Katz, MD - 2015 Honored Educator
 Puneet Bhargava, MD - 2015 Honored Educator

Neuroradiology Series: Stroke

Tuesday, Dec. 1 8:30AM - 12:00PM Location: N230



AMA PRA Category 1 Credits™: 3.25
ARRT Category A+ Credits: 3.50



Discussions may include off-label uses.

Participants

Howard A. Rowley, MD, Madison, WI, (hrowley@uwhealth.org) (*Moderator*) Research Consultant, Bracco Group; Research Consultant, Guerbet SA; Research Consultant, General Electric Company; Consultant, F. Hoffmann-La Roche Ltd; Consultant, W.L. Gore & Associates, Inc; Consultant, Lundbeck Group; ; ; ; ;
Albert J. Yoo, MD, Newton, MA (*Moderator*) Research Grant, Penumbra, Inc; Research Grant, Terumo Corporation; Research Consultant, Medtronic, Inc;

Sub-Events**RC305-01 Imaging for Stroke Triage: Where Do We Stand?**

Tuesday, Dec. 1 8:30AM - 8:55AM Location: N230

Participants

Max Wintermark, MD, Lausanne, Switzerland, (max.wintermark@gmail.com) (*Presenter*) Advisory Board, General Electric Company;

LEARNING OBJECTIVES

1) We will review the most common neuroimaging modalities and treatment algorithms used in the evaluation of acute stroke patients.

ABSTRACT

Neuroimaging has become essential in the evaluation of the acute stroke patient. CT and MRI are used to confirm the diagnosis of acute stroke, exclude stroke mimics, and triage patients for intravenous t-PA and endovascular revascularization therapies. Advanced neuroimaging techniques, including CT-angiography, MR-angiography, CT-perfusion and MR-perfusion further inform acute stroke treatment decisions and are increasingly used in the acute setting. We will review the most common neuroimaging modalities and treatment algorithms used in the evaluation of acute stroke patients.

RC305-02 Feasibility Of Improving Detection Of Early Ischemic Infarction on Head CT Using Continuity-Based Correlative Enhancement.

Tuesday, Dec. 1 8:55AM - 9:05AM Location: N230

Participants

Aseem Sharma, MBBS, Saint Louis, MO (*Presenter*) Stockholder, General Electric Company; Consultant, BioMedical Systems; Co-Founder, Correlative Enhancement, LLC
Manu S. Goyal, MD, MSc, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Michelle M. Miller-Thomas, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Rashmi Jain, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
James D. McEachern, MD, Saskatoon, SK (*Abstract Co-Author*) Nothing to Disclose
Charles F. Hildebolt, DDS, PhD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recognition of early signs of brain infarction may influence patient management, but can be difficult on head CT. Using custom software (patent pending) that manipulates images based on correlation between intensities of continuous pixels, we aimed to assess the feasibility of improving the detection of brain infarction with head CT images.

METHOD AND MATERIALS

35 head CT images through the region of proven infarction and 20 control images across brain tissue without infarction were post-processed using a custom software (patent pending). Three readers, evaluated the baseline and enhanced images in a masked manner, and marked the location of infarction whenever suspected, while using a 5-point scale to rate their confidence for the presence of infarction. In a separate session, readers rated the comparative ease-of-recognition of signs of infarction for baseline and enhanced images on a 7-point scale, while evaluating these images simultaneously along with the follow-up imaging indicating the infarct distribution. Infarct identification data were analyzed with jackknife, alternative, free-response receiver operating characteristic (JAFROC) weighted software. Comparative ease-of-recognition was assessed using the one-sided Wilcoxon signed rank test for differences > a value of 4.

RESULTS

For infarct localization, JAFROC analysis revealed figure-of-merit values of 0.56 and 0.67 for baseline and enhance images respectively ($p=0.03$). Corresponding values for infarct localization within 6 hours of symptom onset were 0.49 and 0.63 ($p = 0.04$). Comparative ease-of-recognition was significantly higher than the equivalent value of 4 for all three readers ($p < 0.01$, 0.03, < 0.01), tilted favorably towards the enhanced images.

CONCLUSION

Continuity-based correlative enhancement improves conspicuity and accurate detection of early changes of brain infarction on non-contrasted head CT.

CLINICAL RELEVANCE/APPLICATION

By improving diagnostic accuracy for detection of ischemic infarction on head CT, continuity-based correlative enhancement may help in making more informed decisions for management of stroke patients.

RC305-03 Diagnostic Accuracy of Whole-brain CT Perfusion in MRI-confirmed Infratentorial Infarctions

Tuesday, Dec. 1 9:05AM - 9:15AM Location: N230

Participants

Kolja M. Thierfelder, MD,MSc, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Christine Bollwein, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Birgit B. Ertl-Wagner, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Louisa von Baumgarten, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Wieland H. Sommer, MD, Munich, Germany (*Presenter*) Founder, QMedify GmbH
Andreas Straube, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recently introduced whole-brain CT perfusion (WB-CTP) allows for an evaluation of the posterior fossa, but data on WB-CTP in this region is limited. Our aim was to determine the diagnostic accuracy of WB-CTP for infratentorial infarctions and to identify factors influencing the detection rate.

METHOD AND MATERIALS

Out of a retrospective cohort of 1361 consecutive patients who underwent WB-CTP due to suspected stroke, we selected all patients with an MRI-confirmed infratentorial ischemic infarction. The study was designed as a case-control study with a ratio of cases to controls without infratentorial infarction of 1:3. Two blinded and experienced readers independently evaluated 4 different perfusion maps - Cerebral Blood Flow (CBF), Cerebral Blood Volume (CBV), Mean Transit Time (MTT), and Time to Drain (TTD) - for the presence and location of an infratentorial perfusion deficit.

RESULTS

Seventy subjects met the inclusion criteria for the patient group. The control group consisted of 210 patients. Overall, WB-CTP reached a sensitivity of 45.4% and a specificity of 93.1%. Infarctions of the cerebellum were detected in 20/38 (53%), while infarctions of the brain stem were detected in only 9/32 (28%) of the cases, $p < 0.05$. Among the different perfusion maps, TTD was the most sensitive (47.2%), followed by MTT (41.0%), CBF (39.2), and CBV (9.1%). With respect to specificity, CBV (98.1%) reached the highest value, followed by CBF (93.8%), TTD (92.9%), and MTT (89.2%). Mean final infarction volume (15.2ml) and diameter (27.1mm) of infarctions that were detected in WB-CTP were significantly larger than volume (5.4ml) and diameter (17.8mm) of infarctions that were not detected (each with $p < 0.001$).

CONCLUSION

Depending on infarction size and localization, whole-brain CT perfusion is able to detect around 45% of infratentorial infarctions with a specificity of around 90%.

CLINICAL RELEVANCE/APPLICATION

Whole-brain CT perfusion is able to detect around 45% of infratentorial infarctions and may be an important alternative in the case of suspected posterior circulation ischemia when MRI is not available.

RC305-04 Intracranial Vessel Imaging at 1.5 Tesla versus 3 Tesla versus 7 Tesla:A Comparison Trial

Tuesday, Dec. 1 9:15AM - 9:25AM Location: N230

Participants

Lale Umutlu, MD, Essen, Germany (*Presenter*) Consultant, Bayer AG
Oliver Kraff, MSc, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Anja Fischer, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Maderwald, PhD, MSc, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Mark E. Ladd, PhD, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas C. Lauenstein, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael Forsting, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marc U. Schlamann, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The increase of the magnetic field strength is associated to an increase in SNR that can be transitioned into imaging at higher spatiotemporal resolution. With the successful implementation of 7T neuro MRI, the aim of this study was to investigate and intraindividually compare non-enhanced MR imaging of intracranial arteries and veins at 1.5 Tesla, 3 Tesla and 7 Tesla utilizing TOF-MRA and susceptibility-weighted imaging.

METHOD AND MATERIALS

10 healthy volunteers were each examined on a 1.5 T (Magnetom Aera, Siemens), a 3T (Magnetom Skyra, Siemens) and a 7T MR system (Magnetom 7T, Siemens) utilizing 32-channel head coils. TOF-MRA and SWI were optimized to achieve best spatial resolution for each field strength while preserving comparable acquisition times. All datasets were read by two radiologists utilizing a 5-point scale (5= excellent vessel delineation to 1= non-diagnostic). All TOF-MRA datasets were assessed for delineation of the intracranial arteries, subdivided into 8 segments (ICA, A1/2, M1,M2,M3,PCA, P1/2, basilar artery). SWI datasets were read for delineation of 14 different smaller and larger veins. Additionally, overall image quality, vessel sharpness, vessel to background contrast and image impairment due to artifacts was assessed. For statistical analysis, a Wilcoxon Rank Test was used.

RESULTS

With increasing magnetic field strength, all sequences could be obtained at higher spatial resolution at comparable acquisition

times, enabling improved vessel delineation. TOF-MRA at 7T enabled a significantly better delineation particularly of small peripheral vessel segments compared to 3T and 1.5T (mean M3 TOF7T=4.3; TOF3T=3.8; TOF1.5T=2.9). 7 Tesla SWI imaging demonstrated its superiority in the highly-detailed delineation of larger and smaller veins with statistical significance to lower field strengths ($p=0.03$) (e.g. average mean value larger veins: SWI7T =4.5, SWI3T =3.3, SWI1.5T =2.7). Overall image quality was rated comparably high for all three field strengths (7T=4.6; 3T=4.7; 1.5T=4.7).

CONCLUSION

Our results demonstrate the benefits of an increase of magnetic field strength from 1.5T to 7T, offering improved and highly-detailed delineation of the intracranial arterial and venous vasculature.

CLINICAL RELEVANCE/APPLICATION

The excellent delineation of non-enhanced vascular structures in 7T neuro MRI may lead to a more accurate diagnosis of vascular disease, such as aneurysms or cavernomas using 7T MRI.

RC305-05 High Resolution Intracranial Vessel Wall Imaging of Atherosclerotic Plaque Characteristics: Correlation with Patient Symptoms

Tuesday, Dec. 1 9:25AM - 9:35AM Location: N230

Participants

Aaron M. Rutman, MD, Seattle, WA (*Presenter*) Nothing to Disclose
Chun Yuan, PhD, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; ;
William D. Hwang, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Niranjan Balu, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Thomas S. Hatsukami, MD, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV
David Tirschwell, MD, MSc, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Adam de Havenon, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Mahmud Mossa-Basha, MD, Seattle, WA (*Abstract Co-Author*) Research support, General Electric Company

PURPOSE

High resolution intracranial vessel wall imaging (VWI) has recently gained attention for its ability to evaluate and differentiate various intracranial arteriopathies, including atherosclerosis (ICAD), inflammatory vasculopathy, arterial dissection, and reversible cerebral vasoconstriction syndrome. VWI also allows for atherosclerotic plaque characterization, depicting potential vulnerable plaque features. The aim was to compare the VWI plaque characteristics between symptomatic and asymptomatic intracranial atherosclerotic lesions using a multi-contrast VWI protocol.

METHOD AND MATERIALS

Cases of ICAD imaged with VWI were collected and retrospectively analyzed from our database between the dates 12/20/12-12/5/13. The imaging protocol included T2, T1 pre and post contrast, 3D T2 SPACE VWI and TOF MRA sequences. Symptomatic plaques were those upstream from an infarct within 6 months of VWI. Lesions with symptoms greater than 6 months prior were excluded. Each plaque was assessed for presence/absence of a fibrous cap, presence of fibrous cap thinning/disruption, cap:necrotic core ratio, and remodeling ratio (total vessel area of diseased segment)/(total vessel area of reference segment). Characteristics were compared by Fisher's exact test (fibrous cap presence, thinning/disruption) and unpaired t-test (cap:necrotic core ratio, remodeling ratio).

RESULTS

48 intracranial atherosclerotic plaques were included from 22 patients. Assessment for fibrous capsule was possible in 18/21 symptomatic and 25/27 asymptomatic plaques. 18/18 symptomatic and 11/25 asymptomatic lesions either did not have a visible fibrous cap, or had apparent disrupted luminal surface or thinning of a visible fibrous cap ($p<<0.01$). There was no significant difference in the cap:lipid core ratio or the remodeling ratio between symptomatic and asymptomatic lesions.

CONCLUSION

VWI allows for evaluation of ICAD characteristics which may indicate plaque vulnerability, and be associated with symptoms. These features might serve as biomarkers for assessing risk, as well as indicate culprit lesions. Our study shows a significantly increased likelihood of absent fibrous cap or fibrous cap rupture/thinning in the setting of symptoms.

CLINICAL RELEVANCE/APPLICATION

VWI of intracranial atherosclerotic plaque can demonstrate characteristics of vulnerable, symptom-associated plaque.

RC305-06 Potential Applications for Intracranial Vessel Wall Imaging

Tuesday, Dec. 1 9:35AM - 10:00AM Location: N230

Participants

David J. Mikulis, MD, Toronto, ON (*Presenter*) Stockholder, Thornhill Research Inc; Research Grant, General Electric Company;

LEARNING OBJECTIVES

1) Understand the issues concerning clinical implementation of intra-cranial vessel wall imaging. 2) Understand how vessel wall imaging can aid in differentiating vasculopathies that have similar angiographic appearances. 3) Understand pitfalls related to arterial wall image interpretation.

ABSTRACT

Modern high field MRI systems with increased multi-element coil design have enabled higher resolution by providing greater overall signal. This in turn has paved the way for imaging smaller parts including the walls of smaller and smaller vascular structures. For example, current technology is capable of generating 3D images with 0.4 x 0.4 x 0.4 mm isotropic voxels using 3T MRI. This has

enabled characterization of circle of Willis vessels out to secondary branches (A2,M2, and P2). Not only has analysis of vasculopathies with identical angiographic appearances been made possible thereby increasing specificity of diagnosis, it has also provided insight into disease pathophysiology. An example of this is the strong relationship found between ischemic stroke and gadolinium enhancing intra-cranial atherosclerotic plaques. The purpose of this presentation therefore is to summarize the current status of arterial wall imaging in clinical neuroradiology.

RC305-07 Update on Acute Stroke Intervention

Tuesday, Dec. 1 10:20AM - 10:45AM Location: N230

Participants

Colin P. Derdeyn, MD, Saint Louis, MO, (colin-derdeyn@uiowa.edu) (*Presenter*) Consultant, Terumo Corporation; Consultant, Penumbra, Inc; Consultant, Silk Road Medical; Stock options, Pulse Therapeutics, Inc; ;

LEARNING OBJECTIVES

1) Describe the current indications for endovascular stroke intervention. 2) Describe the available mechanical devices currently used in these cases.

ABSTRACT

The past 12 months have seen the publication of more positive pivotal clinical trials ($n = 4$) for the treatment of acute ischemic stroke than the last 20 years combined ($n = 6$). Endovascular stroke treatment (EVT) is now proven effective for a large subgroup of patients presenting with acute ischemic stroke. We will carefully review the data from the four recently published trials of endovascular treatment (EVT) for acute ischemic stroke: MR CLEAN (Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands), ESCAPE (Endovascular Treatment for Small Core and Anterior Circulation Proximal Occlusion with Emphasis on Minimizing CT to Recanalization Times), and EXTEND-IA (Extending the Time for Thrombolysis on Emergency Neurological Deficits) and SWIFT PRIME (Solitaire With the Intention For Thrombectomy as Primary Endovascular Treatment for Acute Ischemic Stroke). We will examine the implications of these trials for current practice and future studies. In particular, we will focus on procedural details such as patient selection, devices, adjunctive therapies, treatment time windows and performance metrics.

Active Handout:Colin P. Derdeyn

<http://abstract.rsna.org/uploads/2015/15000010/RC305-07 Stroke-2015-Powers-3020-35.pdf>

RC305-08 Carotid Intraplaque Hemorrhage is Associated with Accelerated Progression in Patients with Acute Ischemic Stroke: A Prospective Multicenter-Study on Carotid Plaque Imaging in Patients with Acute Stroke

Tuesday, Dec. 1 10:45AM - 10:55AM Location: N230

Participants

Andreas Schindler, MD, Munich, Germany (*Presenter*) Nothing to Disclose
Anna Bayer-Karpinska, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Tilman Obenhuber, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Florian Schwarz, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Clemens C. Cyran, MD, Munich, Germany (*Abstract Co-Author*) Research Grant, Bayer AG Research Grant, Novartis AG Speakers Bureau, Bayer AG
Tobias Saam, MD, Munich, Germany (*Abstract Co-Author*) Research Grant, Diamed Medizintechnik GmbH; Research Grant, Pfizer Inc
Andreas D. Helck, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Harloff, Freiburg, Germany (*Abstract Co-Author*) Speaker, Boehringer Ingelheim GmbH Speaker, Bayer AG
Holger Poppert, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Martin Dichgans, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To prospectively evaluate whether carotid plaque hemorrhage - as detected by high-resolution carotid plaque MRI - is associated with an accelerated progression rate of atherosclerosis.

METHOD AND MATERIALS

58 consecutive patients (76.3 ± 9.8 years; 45 male) with acute ischemic stroke in the anterior circulation and non-stenosing carotid plaque in any carotid artery were included in the ongoing multi-center trial (which is also registered on ClinicalTrials.gov). Patients underwent MRI of both carotid arteries at baseline and at 12 months. Carotid plaques were characterized by the American Heart Association (AHA) classification system and plaque burden as well as components such as the lipid-rich/necrotic core, calcifications, and hemorrhage were identified and quantified. Annualized changes for each item were analyzed for both arteries combined on a patient basis for the whole cohort, as well as depending on the status of intra plaque hemorrhage (IPH) at baseline (IPH+ vs. IPH-). Unpaired t-test and one-sample t-test vs. 0 were performed.

RESULTS

A total of 14 patients had complicated AHA-LT6 plaques with IPH at baseline; no new IPH was detected at follow-up. During follow-up a total of four re-events occurred (all IPH+ at baseline). For all patients no significant changes in plaque burden or component size were measurable after one year, with a non-significant increase of mean wall area of 2.3%/year. IPH+ vs. IPH- subjects had a significantly higher progression of the normalized wall index (3.5% vs. 0.5%; $p < 0.05$), and an accelerated progression of mean wall area (7.3% vs. 0.8%; $P = n.s.$ for IPH+ vs. IPH-; $P = 0.037$ for IPH+ vs. 0). No significant quantitative changes for all plaque components were measurable, although mean necrotic core area increased from 6.2 to 7.1 mm² in IPH+ patients (+16%) and remained unchanged in IPH- patients.

CONCLUSION

Intraplaque hemorrhage is associated with an accelerated atherosclerotic plaque progression rate in patients with acute ischemic stroke.

CLINICAL RELEVANCE/APPLICATION

This multi-center study provides further evidence that IPH is a good marker of plaque vulnerability; further studies are needed to test if patients with IPH could profit from more intensive therapy.

RC305-09 Dual-Energy Head CT Can Accurately Distinguish Intraparenchymal Hemorrhage from Calcification in Emergency Department Patients

Tuesday, Dec. 1 10:55AM - 11:05AM Location: N230

Participants

Laleh Daftarbesheli, MD, Boston, MA (*Presenter*) Nothing to Disclose
Ranliang Hu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Joseph Y. Young, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Markus Y. Wu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael H. Lev, MD, Boston, MA (*Abstract Co-Author*) Research support, General Electric Company Stockholder, General Electric Company
Rajiv Gupta, PhD, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stuart R. Pomerantz, MD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company

PURPOSE

Conventional head CT and MRI with gradient-echo susceptibility scanning are limited in their ability to distinguish hemorrhage from calcification, a critical distinction in the selection of stroke patients for IV-thrombolytic and endovascular therapies. Dual energy CT (DECT) scanning, however, may be able to better discriminate calcium from hemorrhage based on the differing proportions of X-ray attenuation of these materials at different scanning energies. The purpose of this study is to evaluate the ability of DECT for differentiation of calcification from acute hemorrhage.

METHOD AND MATERIALS

In this IRB approved study, all unenhanced DECT head exams performed in our emergency department in November and December 2014 were retrospectively reviewed. Patients with at least one focus of intra-parenchymal hyperdensity were included and material decomposition images were post-processed. Virtual non-calcium and calcium overlay images were reviewed for the presence of calcification versus hemorrhage. Relevant prior and follow-up imaging and clinical data were used to determine the reference standard.

RESULTS

Of 399 DECT head exams, 83 (21%) contained at least one intraparenchymal hyperdensity on the corresponding simulated single energy CT (SECT) image; 64/83 (77%) with reference standard proof of diagnosis were included. Mean age was 67 years; 39/64 (61%) were male. 68 distinct intraparenchymal hyperdense lesions were identified, of which 41/68 (60%) were calcification and 27/68 (40%) were hemorrhage. Sensitivity, specificity and accuracy of DECT for the detection of hemorrhage were 96% (CI 81-99%), 100% (CI 91-100%) and 99% (CI 90-100%), respectively. Seven of 27 (26%) of hemorrhages were incorrectly classified by SECT alone, compared to 1/27 (4%) for DECT.

CONCLUSION

DECT post-processed images can distinguish intraparenchymal hemorrhage from calcification rapidly and with very high accuracy in emergency department patients. Conventional gradient-echo MRI and CT scanning are unable to make this distinction accurately. This may have important implications for patient care, most notably in excluding stroke patients with intracranial hemorrhage from IV-thrombolytic and endovascular stroke therapies.

CLINICAL RELEVANCE/APPLICATION

Ability of DECT for differentiation of calcification from hemorrhage has important implications for patient care, most notably in excluding stroke patients with hemorrhage from IV-thrombolytic.

RC305-10 Favorable Outcomes Following Endovascular Treatment in Anterior Circulation Stroke Patients Defined Prospectively Using MRI and Clinical Criteria

Tuesday, Dec. 1 11:05AM - 11:15AM Location: N230

Participants

Ramon G. Gonzalez, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Thabele M. Leslie-Mazwi, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pamela W. Schaefer, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael H. Lev, MD, Boston, MA (*Abstract Co-Author*) Research support, General Electric Company Stockholder, General Electric Company
Natalia Rost, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Lee Schwamm, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Joshua A. Hirsch, MD, Boston, MA (*Abstract Co-Author*) Shareholder, Intratech Medical Ltd

PURPOSE

To evaluate the clinical efficacy of major anterior circulation stroke thrombectomy in patients prospectively classified by specific MRI and clinical criteria.

METHOD AND MATERIALS

72 patients with MCA or terminal ICA occlusion by CTA, followed by core infarct volume determination by MRI, underwent thrombectomy after meeting institutional criteria. 40 patients were prospectively classified as Likely to Benefit (LTB) using the following institutional criteria: DWI lesion volume <70ml, age < 80, stroke onset to procedure initiation < 6 hours and baseline mRS ≤1. Thirty two were prospectively classified as Uncertain to Benefit (UTB) if one or more of the clinical criteria were not met or if the DWI lesion was 70-100 ml. Outcomes were based on 90-day modified Rankin score (mRS). Favorable outcomes were defined as 90 day mRS of 0, 1 or 2.

RESULTS

Reperfusion (mTICI 2b or 3) and prospective categorization as LTB were strongly associated with favorable outcomes ($p < 0.001$ and $p < 0.005$, respectively). Successful reperfusion had a significant positive impact on the distribution of mRS scores of the LTB cohort ($p < 0.0001$). Intervention resulted in successful reperfusion in 68% of the LTB patients and 75% of UTB patients (not significant). Favorable outcomes were obtained in 53% and 25% of LTB and UTB patients that were treated, respectively ($p = 0.016$; Fisher exact test). In considering the effect of successful intervention, favorable outcomes were observed in 74% of LTB patients that had successful reperfusion compared to 33% of successfully reperfused UTB patients ($p = 0.004$; Fisher exact test).

CONCLUSION

Patients prospectively classified as Likely to Benefit based on MRI and clinical criteria have a high likelihood of favorable outcome after thrombectomy, particularly if reperfusion is successful.

CLINICAL RELEVANCE/APPLICATION

This work demonstrates how to achieve high levels of favorable outcomes in severe ischemic stroke patients by using imaging for selection of appropriate patients for endovascular therapy.

RC305-11 Body Temperature Fluctuations Modulate Infarct Expansion, Penumbral Rescue, and Clinical Outcome in Acute Ischemic Stroke Following Successful Endovascular Reperfusion: Impact of Subclinical Temperature Changes on Ischemic Progression

Tuesday, Dec. 1 11:15AM - 11:25AM Location: N230

Participants

Seena Dehkharghani, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Meredith Bowen, BA, Atlanta, GA (*Presenter*) Nothing to Disclose
Diogo C. Haussen, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Michael Frankel, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Adam B. Prater, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Andrey Lima, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Tyler Gleason, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Raul G. Nogueira, MD, Boston, MA (*Abstract Co-Author*) Consultant, Stryker Corporation Consultant, Medtronic, Inc Consultant, CoAxia, Inc

PURPOSE

The exquisite temperature sensitivity of neuronal substrate has been thoroughly expounded in past studies. The effect of systemic temperature changes on stroke progression, and its impact upon the fate of at-risk tissues remains unknown. We undertook the analysis of temperature fluctuations and their interaction with rescue of penumbral tissues in a cohort of successfully revascularized acute stroke patients, hypothesizing greater relative infarct expansion as a function of sub-clinical systemic temperature changes.

METHOD AND MATERIALS

129 patients with acute stroke presenting within 12 hours were culled from our prospective registry. CT perfusion was obtained, with perfusion analysis undertaken in a user- and vendor-independent processing environment (RAPID). Automated lesion segmentation and thresholding of CTP data produced core, penumbral, and mismatch volumes. Final infarct volumes (FIV) were measured from DWI, and relative infarct growth (FIV-core/mismatch) computed. Systemic temperatures were recovered from medical records for the duration of hospitalization (up to q15 minutes), with minima, maxima, and ranges collected. All patients underwent successful endovascular reperfusion (mTICI IIb/III). Kendall's tau correlation was prescribed to assess the association between temperature change from baseline and both relative infarct growth (RIG) and favorable clinical outcome (FCO) as 90d mRS ≤ 2 .

RESULTS

59 men and 70 women (age 63 ± 14 yrs) with acute stroke (NIHSS median[IQR]=19[9]; time to groin puncture median[IQR]=330[301]) were examined. All patients exhibited an occlusive lesion of the anterior circulation (ICA/MCA) with successful reperfusion (mTICIIb/III). Median core (rCBF), penumbral (Tmax), and FIV (median[IQR]) were 9.6cc[25], 131cc[125], and 21cc[37], respectively. Mean temperature minima=35.1°C and maxima=37.9°C. Correlational analysis demonstrated significant associations between temperature fluctuation from baseline and both RIG ($P=0.01$) and FCO ($P < 0.001$).

CONCLUSION

The impact of sub-clinical temperature changes had not previously been reported as a driving factor in penumbral rescue, however the present findings suggest that neuronal fate may be affected by even minor temperature changes

CLINICAL RELEVANCE/APPLICATION

Sub-clinical temperature dysregulation may potentiate neuronal injury following acute ischemic stroke, compelling further investigation into the mechanistic relationship.

RC305-12 Impact of the Implementation of Thrombectomy with Stent Retrievers on the Frequency of Hemispherectomy in Patients with Acute Ischemic Stroke

Tuesday, Dec. 1 11:25AM - 11:35AM Location: N230

Participants

Peter Sporns, MD, Munster, Germany (*Presenter*) Nothing to Disclose
Jens Minnerup, Munster, Germany (*Abstract Co-Author*) Nothing to Disclose
Tarek Zoubi, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Uta Hanning, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Walter L. Heindel, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Wolfram Schwindt, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas Niederstadt, MD, Munster, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The increasing use of endovascular treatments has led to higher recanalization rates and better clinical outcomes compared to intravenous thrombolysis alone. Stent retrievers represent the latest development for recanalization of large vessel occlusions. Decompressive hemicraniectomy has proved beneficial in patients suffering from rising intracranial pressure after malignant stroke. We investigated the effect of the implementation of stent retriever treatment on the frequency of hemicraniectomy as a surrogate marker for infarct size and thus for poor neurological outcome.

METHOD AND MATERIALS

Patients with acute ischemic stroke were retrospectively studied. We compared the frequency of hemicraniectomy following proximal artery occlusion of the internal carotid artery and middle cerebral artery main stem in the years before (2009 and 2010) and after (2012 and 2013) introducing stent retrievers.

RESULTS

Overall, 497 patients with proximal arterial occlusion were included in the study. Of 253 patients admitted in the years 2009 and 2010 44 (17.4 %) and of 244 patients admitted in 2012 and 2013 20 (8.2 %) received a hemicraniectomy. This decrease in the proportion of hemicraniectomies was statistically significant ($p < 0.01$).

CONCLUSION

The findings in this study illustrate a significantly reduced rate of hemicraniectomies in patients with proximal artery occlusions after implementation of thrombectomy with stent retriever. Hereby we could show a significant reduction of malignant infarctions after thrombectomy with stent retriever.

CLINICAL RELEVANCE/APPLICATION

Stent retriever is a safe and effective device and improves clinical outcome.

RC305-13 Hallmarks of Pediatric Ischemic Stroke

Tuesday, Dec. 1 11:35AM - 12:00PM Location: N230

Participants

Arastoo Vossough, MD, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the epidemiological features and risk profiles of stroke in different pediatric patient populations. 2) Classify the types of pediatric stroke and features of vasculopathies leading to stroke. 3) Identify major mimickers of pediatric arterial ischemic stroke. 4) Specify current approved treatment options available for pediatric stroke 5) Identify recent and ongoing clinical trials in pediatric stroke.

Emergency Radiology Series: Current Imaging of the Acute Abdomen

Tuesday, Dec. 1 8:30AM - 12:00PM Location: N228



AMA PRA Category 1 Credits™: 3.25
ARRT Category A+ Credits: 4.00

Participants

Douglas S. Katz, MD, Mineola, NY (*Moderator*) Nothing to Disclose
Michael N. Patlas, MD, FRCPC, Hamilton, ON, (patlas@hhsc.ca) (*Moderator*) Nothing to Disclose
Hani H. Abujudeh, MD, MBA, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

RC308-01 CT and MR of Acute Appendicitis

Tuesday, Dec. 1 8:30AM - 8:55AM Location: N228

Participants

Perry J. Pickhardt, MD, Madison, WI (*Presenter*) Co-founder, VirtuoCTC, LLC; Stockholder, Collectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT ; Research Grant, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Assess the relative advantages and disadvantages for CT and MR imaging in the setting of suspected appendicitis. 2) Compare the diagnostic performance of CT and MR for both appendicitis and alternative conditions. 3) Describe the increasing use of MR for abdominal imaging in the ED setting.

ABSTRACT

N/A

Honored Educators

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Perry J. Pickhardt, MD - 2014 Honored Educator

RC308-02 T1 Bright Appendix Sign is Helpful for the Diagnosis of Acute Appendicitis in Pregnant Women

Tuesday, Dec. 1 8:55AM - 9:05AM Location: N228

Participants

Ilah Shin, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic value of T1 bright appendix sign for the diagnosis of acute appendicitis in pregnant women

METHOD AND MATERIALS

This retrospective study included 125 pregnant women with suspected appendicitis who underwent MRI, including axial T2WI with/without fat saturation, coronal and sagittal T2WI, and 3D T1WI. Total of 22 patients were surgically confirmed as acute appendicitis. T1 bright appendix sign was defined as T1 high signal intensity (SI) material filling more than half length of appendix while this T1 high SI did not result from appendicolith on 3D T1WI. MR images were reviewed by two experienced radiologists in consensus and visibilities of the appendices were evaluated. The maximal diameter of visible appendix with presence or absence of T1 bright appendix sign was evaluated from MR. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of T1 bright appendix sign were calculated

RESULTS

In patients with acute appendicitis (n=22), appendix was visualized in all patients and the mean diameter of the appendix was 9.4 ± 2.7 mm (range, 6.0-14.6 mm). In patients with a normal appendix (n=103), appendix was not visualized in 14 patients (13.6%). The mean diameter of the visualized normal appendix was 5.0 ± 0.7 mm (range, 3.1-6.8 mm). Among patient without appendicitis, T1 bright appendix sign was seen in 40 patients (45%), whereas it was noted in only 1 patient with acute appendicitis (4.5%). Fourteen patients had borderline sized appendix (appendix diameter between 6 - 7 mm) and 4 out of 14 patients were diagnosed as appendicitis. Among them, T1 bright appendix sign was seen in 4 patients without appendicitis. The sensitivity, specificity, PPV and NPV of T1 bright appendix sign for the diagnosis of normal appendix were 45%, 96%, 98%, and 30% for all patients and 60%, 100%, 100%, and 50% for patients with borderline sized appendix

CONCLUSION

T1 bright appendix sign was a specific finding for the diagnosis of normal appendix in pregnant women suspected of acute appendicitis

CLINICAL RELEVANCE/APPLICATION

If a bright appendix sign is seen in pregnant women with suspected appendicitis, the probability of acute appendicitis might be low

RC308-03 Optimization of MR Protocols in Pregnant Women with Suspected Acute Appendicitis

Tuesday, Dec. 1 9:05AM - 9:15AM Location: N228

Participants

Ilah Shin, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the optimal MR protocols in pregnant women who were suspected of acute appendicitis

METHOD AND MATERIALS

This retrospective study included 125 pregnant women (mean IUP, 21.6; range, 16-30 weeks) with suspected appendicitis. MR images were reviewed by two experienced radiologists in consensus in 3 separate sessions. On session 1, axial single shot (SSH) T2WI, respiratory gated fat saturated T2WI, 3D T1 weighted images (set 1) were reviewed. In session 2 and 3, set 1 + coronal T2WI (set 2) and set 2 + sagittal T2WI were reviewed respectively. The visibility of appendix (1: not identified - 5: entirely visualized) and probability of appendicitis (1: not appendicitis - 5: definite appendicitis) were evaluated in each session. If diseases other than appendicitis were suspected, reviewers were asked to provide specific diagnosis with a 5-point scale confidence level. Visualization score and diagnostic performance were compared by ANOVA and chi-square test. Area under the curve (Az) value was compared with DeLong methods

RESULTS

Visualization scores of appendix was slightly increased in both set 2 (4.5 ± 1.3) and set 3 (4.5 ± 1.3) compared to set 1 (4.2 ± 1.3) without statistical significance (ANOVA, $P=0.214$). There was no significant differences in confidence level among three groups, in both patients with appendicitis (4.9 in all sets, $P>0.999$) and without appendicitis (1.2 in all sets, $P=0.914$). Eighteen patients had been diagnosed to other diseases including ureter stone (1), obstruction (3), torsion (7), acute pyelonephritis (2), hemoperitoneum (2), colon cancer (2), and terminal ileitis (1). Sensitivity and accuracy were increased in set 2 (77.8%, 96.8%) and set 3 (83.3%, 97.6%) compared to set 1 (66.7%, 95.2%) for the diagnosis of other disease. Az value was significantly higher in set 3 (Az, 0.917) compared to both set 2 (Az, 0.889) and set 1 (Az, 0.833, $P < 0.05$)

CONCLUSION

Axial T2WI with/without fat saturation and 3D T1WI were sufficient for the diagnosis of acute appendicitis. However, additional coronal and sagittal SSH T2WI were required for the accurate diagnosis of disease other than appendicitis in pregnant women

CLINICAL RELEVANCE/APPLICATION

Although axial T2WI and 3D T1WI is sufficient for the diagnosis of appendicitis, coronal and sagittal T2WI might be needed for the accurate diagnosis of diseases other than acute appendicitis in pregnant women who are suspected of acute appendicitis

RC308-04 "Saving Time without Sabotaging Diagnosis"- The FAST MR Protocol for Evaluating Acute Appendicitis in the Emergency Setting

Tuesday, Dec. 1 9:15AM - 9:25AM Location: N228

Participants

Memoona Mian, MD, FRCR, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Ismail T. Ali, MBChB, MD, Vancouver, BC (*Presenter*) Nothing to Disclose

Teresa I. Liang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

Triona M. Walshe, FFRCSI, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Silvia D. Chang, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Acute appendicitis is a major concern especially in young females presenting to ER with right iliac fossa pain. Prompt diagnosis/exclusion has major implications in the urgent care setting. Due to concerns for radiation exposure with CT scan, MR is gaining popularity as the imaging of choice given the low yield of ultrasound in such cases. In this study, we assess the diagnostic performance of FAST MR protocol comprising T2 HASTE and DW imaging for investigating such patients in the Emergency department.

METHOD AND MATERIALS

50 patients (49 Females; mean age 25.4 ± 5.2 yrs) with MR imaging between July 2017 and March 2015 for possible acute appendicitis were reviewed. MR abdomen/pelvis performed on 1.5 T MR per departmental protocol included axial T1 gradient echo in-out of phase, transverse FSE T2 with fat sat/motion correction, axial/coronal T2 HASTE and axial DWI images. In a randomized blinded fashion, two independent radiologists with > 5 years' experience in acute imaging reviewed both protocols for presence/absence of acute appendicitis with interpretation confidence on a five point scale (5 : highly confident to 1: nondiagnostic). Mean acquisition and interpretation times for both protocols were calculated. Sensitivity, specificity and accuracy for the FAST protocol was calculated, using clinical disposition of the patient as gold standard.

RESULTS

Mean scan time for FAST and FULL protocol was calculated to be 21.1 min and 40.5 min respectively. Mean interpretation time for FAST protocol for reader one and two was 4.1 ± 1.5 min and 4.5 ± 1.4 min and for FULL protocol was 8.1 ± 1.8 min and 7.1 ± 1.4 min respectively. The appendix was not confidently identified in 3 scans which were considered negative for the purpose of this study given the absence of indirect signs of inflammation like fat stranding, free fluid. Sensitivity, specificity and accuracy for the FAST protocol were calculated to be 100% each for reader one and 75%, 100% and 94% respectively for reader two.

CONCLUSION

The FAST MR protocol with high diagnostic accuracy in detecting/excluding appendicitis and significant reduction in scan/interpretation time can be a valuable tool for assessing patients with possible acute appendicitis in the ER setting.

CLINICAL RELEVANCE/APPLICATION

FAST MR protocol significantly reduces scan/read times without sabotaging diagnostic accuracy for evaluating acute appendicitis, thus is an efficient and cost-effective technique in the ER setting.

RC308-05 CT Angiography for Gastrointestinal Hemorrhage

Tuesday, Dec. 1 9:25AM - 9:50AM Location: N228

Participants

Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review an appropriate algorithm for the evaluation of patients presenting with overt lower intestinal bleeding, with emphasis on CT angiography. 2) To describe the proper CT angiography technique for overt gastrointestinal bleeding. 3) Illustrate with multiple examples the CT angiographic findings of active gastrointestinal bleeding, as well as potential pitfalls in interpretation.

ABSTRACT

Overt gastrointestinal bleeding is a common and serious condition that may threaten a patient's life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectives of the diagnostic evaluation. The diagnostic algorithm implemented in these acutely ill patients include various imaging modality options, as well as upper endoscopy and colonoscopy. For patients presenting with hematochezia, implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as imprecise localization of the source of bleeding. CT angiography offers logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

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Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

RC308-06 The Association of the Hypovolemic Shock Complex and Patient Mortality in Patients with Acute Internal Hemorrhage of the Abdomen and Pelvis

Tuesday, Dec. 1 9:50AM - 10:00AM Location: N228

Awards

RSNA Country Presents Travel Award

Participants

Benjamin Fritz, MD, Freiburg, Germany (*Presenter*) Nothing to Disclose
Jan Fritz, MD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Siemens AG; Research Consultant, Siemens AG; Speaker, Siemens AG
Philippe A. Dovi-Akue, MD, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Maximilian Russe, MD, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Mathias F. Langer, MD, PhD, Freiburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Elmar C. Kotter, MD, MSc, Freiburg, Germany (*Abstract Co-Author*) Editorial Advisory Board, Thieme Medical Publishers, Inc

PURPOSE

The hypovolemic shock complex (HSC) constitutes computed tomography (CT) signs that are believed to be related to hypovolemic shock; however, its association with patient prognosis is unclear. We, therefore, sought to determine the frequency of HSC signs in patients with acute internal hemorrhage of the abdomen and pelvis and their association with patient mortality.

METHOD AND MATERIALS

A retrospective search of our hospital database between 2012 and 2014 derived 197 patients with clear contrast-enhanced MDCT demonstration of acute internal hemorrhage of the abdomen and pelvis. Experienced observers evaluated the CT studies for 10 different radiological signs of HSC. The frequencies of HSC signs were correlated with death during hospitalization.

RESULTS

44/197 (22.3%) of the patients died. The mortality group showed an average of 3.0 HSC signs, whereas the survival group showed 1.1 ($p<0.001$). Mortality and survival groups showed differences of the frequency of hyperenhancing adrenal glands (70.5% (31/44) vs. 19.0% (29/153), $p<0.001$), halo sign (54.5% (24/44) vs. 32% (48/150), $p=0.01$), splenic hypoperfusion (37.2% (16/43) vs. 4% (6/151), $p<0.0001$), altered renal enhancement (15.9% (7/44) vs. 3.3% (5/153), $p=0.033$), shock bowel (22.7% (10/44) vs. 3.3% (5/150), $p=0.005$), liver hypoperfusion (15.9% (7/44) vs. 3.3% (5/153), $p=0.004$), and hyperenhancement/edema of the gallbladder

(12.1% (4/33) vs. 0% (0/137), $p=0.044$). No significant differences existed for a flat IVC (59.1% (26/44) vs. 45.1% (69/153), $p=0.103$), small diameter aorta (9.5% (4/42) vs. 6.5% (10/153), $p=0.516$) and pancreatic hyperenhancement/edema (6.8% (3/44) vs. 0% (0/153), $p=0.083$). 10% (7/73) of patients with no signs of HSC died compared to 11% (5/44) with 1, 27% (9/33) with 2, 33% (8/24) with 3, 67% (4/6) with 4, 44% (4/9) with 5, 67% (2/3) with 6, 100% (2/2) with 7, 100% (2/2) with 8 and 100% (1/1) with 9 HSC signs.

CONCLUSION

HSC signs are common in patients with acute internal hemorrhage. Patient mortality significantly increases if 2 or more signs are present. While several signs are associated with increased mortality, inferior vena cava, aorta and pancreas signs have the weakest association.

CLINICAL RELEVANCE/APPLICATION

Timely MDCT diagnosis and reporting of the HSC can contribute to appropriate management of the acute patient care and prognosis.

RC308-07 Question and Answer

Tuesday, Dec. 1 10:00AM - 10:15AM Location: N228

Participants

RC308-08 Imaging of Bowel Ischemia

Tuesday, Dec. 1 10:15AM - 10:40AM Location: N228

Participants

Vincent M. Mellnick, MD, Saint Louis, MO, (mellnickv@mir.wustl.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To apply protocols for CT and MRI that are best for identifying and characterizing bowel ischemia. 2) To compare the underlying causes and imaging findings of bowel ischemia, including nonocclusive ischemia, arterial and venous occlusion, vasculitis, and obstruction. 3) To differentiate the CT and MRI findings of bowel ischemia due in various stages of chronicity. 4) To use this information to better detect bowel ischemia in clinical practice and recommend appropriate management.

ABSTRACT

N/A

RC308-09 CT for Acute Nontraumatic Abdominal Pain - Is Oral Contrast Really Required? Initial Conclusions

Tuesday, Dec. 1 10:40AM - 10:50AM Location: N228

Participants

Rivka Kessner, Tel Aviv, Israel (*Presenter*) Nothing to Disclose
Sophie Barnes, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Pinhas Halpern, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Vadim Makrin, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Arye Blachar, MD, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic performance of abdominal CT performed with and without oral contrast, in patients presenting to the ED with acute nontraumatic abdominal pain.

METHOD AND MATERIALS

Our prospective study was conducted on a sample of adult patients presenting with nontraumatic abdominal pain to the ED of a large tertiary medical center. 250 patients with acute abdominal pain that underwent IV contrast-enhanced abdominal CT were enrolled over a 9-month period. 125 patients were recruited for the study group using convenience sampling, and underwent CT without oral contrast. A control group of 125 patients was recruited, matching the cohort groups' gender and age and underwent abdominal CT during the same week - with oral contrast material. Exclusion criteria were: pregnancy, history of IBD, recent abdominal operation, suspected renal colic, AAA rupture or intestinal obstruction. The exams were first reviewed by the senior attending radiologist to determine if an additional scan with oral contrast was required. Two senior radiologists then performed consensus reading to determine the significance of the lack of oral contrast administration. The reviewers also determined specific technical and imaging findings, including the presence of oral contrast in the pathological area and the influence of the technique on some radiological findings.

RESULTS

Each group consisted of 67 males and 58 females. The average age of the two groups was 46.9 years. The main diagnoses were appendicitis (20%), diverticulitis (8.4%), colitis (6.4%) and a normal CT exam (40.4%). There was no significant difference between the groups regarding the history of the patients and the technique of the studies. Among the 125 patients of the study group, no patient had to undergo additional scan in order to establish the correct diagnosis. In only 1 patient from each group (0.8%), contrast material was considered to be necessary. In 8 patients from the study group (6.4%) and 5 patients from the control group (4%) oral contrast was considered helpful.

CONCLUSION

Our study indicates that examination of patients with acute nontraumatic abdominal pain with CT scans without oral contrast material - are diagnostic and have comparable performance to scans performed after oral contrast administration.

CLINICAL RELEVANCE/APPLICATION

Our study indicates that patients presenting to the ED with acute nontraumatic abdominal pain, may be examined with CT without

oral contrast material.

RC308-10 Assessing the Prevalence and Clinical Relevance of Positive Abdominal and Pelvic CT Findings in Senior Patients Presenting to the Emergency Department.

Tuesday, Dec. 1 10:50AM - 11:00AM Location: N228

Participants

Abdullah Alabousi, MD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Michael N. Patlas, MD,FRCPC, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Malek Meshki, MD, Hamilton, ON (*Presenter*) Nothing to Disclose
Sandra Monteiro, PhD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively evaluate the prevalence and clinical relevance of positive abdominal and pelvic CT(A/P CT) findings for patients ages 65 and older, when compared with all other Emergency Department (ED) patients undergoing A/P CT during the same time period.

METHOD AND MATERIALS

An IRB-approved retrospective review of all adult patients who underwent an emergency 64-MDCT of the abdomen and pelvis for acute non-traumatic abdominal complaints over a two-year period at a single institution was performed. The prevalence and clinical relevance of positive CT findings was assessed for patients <65 and >65. Statistical comparisons were made with Student t-tests.

RESULTS

2102 patients between 10/1/2011 and 9/30/2013 were reviewed. 1009 patients were excluded as their CT was performed to assess for trauma, for post-operative changes, or because the patients had a known diagnosis or the CT examination was performed for cancer staging. 631 patients were included in the <65 group (298 men and 333 women; mean age 46, age range 18-64), and 462 were included in the >65 group (209 men and 253 women; mean age 78, age range 65-99). Overall, there were more positive CT findings explaining the abdominal/pelvic pain for patients <65 (388 positive cases, 61.5%), compared with the >65 group (258 positive cases, 55.8%), which was a statistically significant difference ($p<0.03$). However, patients >65 were more likely to have clinically/surgically relevant findings. 50% of patients >65 presenting with appendicitis had complications evident on the initial CT, compared with 27% of those <65 ($p<0.05$). In addition, bowel obstruction (41 vs 27 patients, $p<0.05$), ruptured abdominal aortic aneurysm (7 vs 2 patients, $p<0.05$) and malignancy (19 vs 12 patients, $p<0.05$) were all more common in individuals presenting to the ED >65 years of age.

CONCLUSION

The findings of our retrospective study refute the hypothesis that there is increased prevalence of positive abdominal and pelvic CT findings in patients >65. However, older patients in our series were more likely to present with clinically/surgically relevant findings, and a lower threshold for ordering imaging examinations in this patient population should be considered.

CLINICAL RELEVANCE/APPLICATION

64-MDCT shows more clinically/surgically relevant findings in individuals older than 65 than in younger patients presenting to the Emergency Department with acute non-traumatic abdominal complaints.

Honored Educators

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Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator

RC308-11 MR of the Acute Abdomen

Tuesday, Dec. 1 11:00AM - 11:25AM Location: N228

Participants

Stephan W. Anderson, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To overview the current utilization of MR of the acute abdomen, with an emphasis on protocol optimization, and correct interpretation, using case examples. 2) To examine potential pitfalls in the interpretation of MR of the acute abdomen. 3) To review the current literature of MR of the acute abdomen.

RC308-12 The "Onyx Rim" Sign in Pelvic MRI: Perifollicular Hemorrhage as a Potential Predictor of Viability in the Setting of Ovarian Torsion

Tuesday, Dec. 1 11:25AM - 11:35AM Location: N228

Participants

Iva Petkovska, MD, Tucson, AZ (*Presenter*) Nothing to Disclose
Zeena Irani, MD, MS, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Bobby T. Kalb, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Christopher Geffre, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Janiel Cragun, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
James R. Costello, MD, PhD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose
Hina Arif Tiwari, MD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose

Ferenc Czeyda-Pommersheim, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Diego R. Martin, MD, PhD, Tucson, AZ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To correlate noncontrast MRI features of perfollicular hemorrhage with ovarian viability in the clinical setting of torsion.

METHOD AND MATERIALS

This is an IRB-approved retrospective review of 8 patients with ovarian torsion on MRI confirmed with intraoperative exam. Preoperative MR exams were performed on either a 1.5T/3.0T system (Siemens Magnetom Aera/Skyra) using 18-channel anterior abdominal and pelvic surface coils. Images were acquired without breath holding using multiplanar T2-weighted Half-Fourier Single-shot Echo-train (HASTE) sequences, repeated with fat-suppression using SPECTral Adiabatic Inversion Recovery (SPAIR). All MRIs were retrospectively reviewed in a blinded fashion separately by two radiologists for the presence or absence of a T2-hypointense perfollicular rim. This finding, when present, was utilized as a predictor of nonviability of the torsed ovary. Each torsed ovary was categorized as either a) viable or b) nonviable based on presence/absence of a perfollicular T2-hypointense rim. Clinical outcomes were determined by either a) histopathologic correlation, or b) imaging follow-up and review of the patient's medical records.

RESULTS

Of 8 patients with ovarian torsion on MRI, 5 were categorized as non-viable on MRI due to the presence of a perfollicular T2 hypointense rim, and 3 as viable due to a lack of perfollicular T2-hypointense rim. Using the reference standards of pathology (n=5) and medical chart review and imaging follow-up (n=3), MRI demonstrated a sensitivity of 100 %, and specificity of 100 % for predicting viability of a torsed ovary based on presence of a perfollicular T2-hypointense rim. Histopathological correlation demonstrated perfollicular hemorrhage separating the theca interna and externa in every patient with non-viable ovaries, corresponding to the perfollicular T2-hypointensity identified on preoperative MRI.

CONCLUSION

Preoperative noncontrast MRI may hold promise for the prediction of ovarian viability in clinical setting of torsion.

CLINICAL RELEVANCE/APPLICATION

Preoperative MRI for the diagnosis of ovarian torsion may provide a biomarker for prediction of ovarian viability, with potential impact on preoperative planning and management.

RC308-13 Diagnostic Performance of Individual and Combined MR Signs of Acute Cholecystitis

Tuesday, Dec. 1 11:35AM - 11:45AM Location: N228

Participants

Avneesh Gupta, MD, Boston, MA (*Presenter*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the performance of individual and combined MR signs of acute cholecystitis, and to propose a rapid non-contrast MR protocol for emergency diagnosis of right upper quadrant pain.

METHOD AND MATERIALS

The institutional review board approved this HIPAA-compliant retrospective study. Informed consent was waived. 288 patients presenting to the emergency department with acute right upper quadrant pain between 10/3/2010 and 11/28/2012 undergoing MR within 48 hours of US were included. MR was performed in all included patients due to equivocal US and persistent symptoms. Individual MR signs were graded in a blinded fashion using single shot T2, diffusion (b=0, b=600) and 3D GRE post contrast sequences. Sensitivity and specificity values for individual and combined imaging signs were calculated using surgical diagnosis as the reference standard for acute cholecystitis.

RESULTS

Of 288 patients, 128 were treated conservatively and excluded from analysis. 160 underwent cholecystectomy and 77 were diagnosed with acute cholecystitis at surgery. Sensitivities of the MR findings of gallstones, distention, wall thickening, pericholecystic fluid, gallbladder fossa restricted diffusion, wall restricted diffusion, gallbladder fossa hyper enhancement and wall hyper enhancement for the detection of acute cholecystitis were 96%, 59.7%, 72.7%, 49.4%, 47.3%, 26.7%, 55% and 11%, respectively. Corresponding specificities were 24.6%, 71%, 55.9%, 78.2%, 74.8%, 88.3%, 83.2% and 98.4%. Combining stones, distention, pericholecystic fluid and gallbladder fossa restricted diffusion yielded sensitivity of 35% and specificity of 92.7%, and these findings were identifiable using single shot T2 and diffusion sequences only. The combination of stones, distention and gallbladder fossa hyper enhancement was 43.8% sensitive and 89.6% specific for acute cholecystitis.

CONCLUSION

Individual and combined MR features show high specificity for acute cholecystitis. Most signs can be detected by diffusion and single shot T2 weighted sequences only. Gallbladder fossa restricted diffusion is a novel imaging sign, and when combined with the presence of gallstones, pericholecystic fluid and distention yields a specificity of 92.7% for acute cholecystitis.

CLINICAL RELEVANCE/APPLICATION

A highly specific, rapid non-contrast MR protocol consisting of diffusion and single shot T2 weighted sequences can be effective for the diagnosis of acute cholecystitis when US findings are equivocal.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at:

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Jorge A. Soto, MD - 2013 Honored Educator

Jorge A. Soto, MD - 2014 Honored Educator

Jorge A. Soto, MD - 2015 Honored Educator

RC308-14 Question and Answer

Tuesday, Dec. 1 11:45AM - 12:00PM Location: N228

Participants

Emergency Radiology Tuesday Poster Discussions

Tuesday, Dec. 1 12:15PM - 12:45PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

ParticipantsJamlik-Omari Johnson, MD, Atlanta, GA (*Moderator*) Nothing to Disclose**Sub-Events****ER220-SD-TUA2 Modification of CT Pulmonary Embolism Contrast Dose Using Cardiac Output Determined From Pulmonary Arterial Test Bolus Data**

Station #2

ParticipantsLauren Sawatzky, Vancouver, BC (*Presenter*) Nothing to DiscloseNicolas J. Bilbey, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to DiscloseSavvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AGTim O'Connell, MD, Meng, Vancouver, BC (*Abstract Co-Author*) President, Resolve Radiologic Ltd; Speake, Siemens AGLuck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to DiscloseJohn R. Mayo, MD, Vancouver, BC (*Abstract Co-Author*) Speaker, Siemens AGPatrick D. McLaughlin, FFRRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG**PURPOSE**

The purpose of this study was to retrospectively determine if cardiac output (CO) as derived from pulmonary arterial test bolus data can be used to predict which patients will have suboptimal and supra-optimal opacification of the pulmonary arteries in CTPE studies.

METHOD AND MATERIALS

CTPE studies from 209 consecutive patients (90 men, 119 women; mean age of 58.56 ± 18.28) were selected for preliminary analysis. A circular ROI in the main pulmonary artery (MPA) was used to measure mean vessel attenuation in each study. 34 CTPE studies (16 men, 18 women; mean age of 47.33 ± 12.37) with inadequate vessel opacification (below 250 HU) and 32 CTPE studies (5 men, 27 women; mean age of 61.25 ± 15.98) with excess vessel opacification (above 425HU) were then selected for inclusion. In each case a circular ROI in the MPA of the test bolus images was used to plot change in attenuation as a function of time. The area under the attenuation-time curve (AUC) was calculated using numerical integration. Sequential linear and exponential trend-lines were used to predict the expected curve progression for incomplete washout phases. Based on our prior investigation of pulmonary arterial test bolus curves, an equation determining CO from AUC ($AUC = -84.142 \times CO + 1233.2$) was used to estimate CO.

RESULTS

The mean attenuation and CO for the excess opacification cohort were 528.84 ± 73.51 HU and 4.88 ± 1.34 L/min respectively, with 68.8% of patients demonstrating a CO less than 5.5 L/min. The mean attenuation and CO for the inadequate opacification cohort were 206.25 ± 29.89 HU and 7.03 ± 1.18 L/min respectively, with 73.5% of patients demonstrating a CO greater than 6.5 L/min. An unpaired t-test for the difference in mean cardiac outputs between groups was highly statistically significant (two-tailed $P < 0.0001$).

CONCLUSION

Cardiac output is a significant determinant of MPA vessel opacification in CTPE studies. Pulmonary arterial test bolus data could potentially be used to help reduce contrast load in patients with low cardiac output and to help strategically increase contrast load in those with high cardiac output.

CLINICAL RELEVANCE/APPLICATION

CO measured from MPA test bolus curves can be used to screen patients for potentially non-optimal and supra-optimal CTPE vessel opacification. Modifying contrast protocol could potentially improve image quality or reduce contrast load in these patients.

ER222-SD-TUA4 Diameter with Compression on CT: Can It Be a Useful Indicator for Diagnosis of Acute Appendicitis ?

Station #4

ParticipantsJi Won Rim, Hwaseong, Korea, Republic Of (*Presenter*) Nothing to DiscloseMin Yeong Kim, MD, Hwaseong, Korea, Republic Of (*Abstract Co-Author*) Nothing to DiscloseJung-Ah Choi, MD, Hwaseong, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose**PURPOSE**

To evaluate the diameter with compression (DWC) of appendices as a useful CT criterion in equivocal appendicitis.

METHOD AND MATERIALS

We retrospectively collected 363 patients with visible appendices on CT after clinicopathologic confirmation of appendicitis and periappendiceal inflammatory diseases (PaID). Each CT feature was evaluated by an experienced abdominal radiologist: maximal outer diameter (MOD), DWC, mural thickness (MT) and mural enhancement, periappendiceal infiltration, and appendicolith. DWC is the expected diameter after deduction of intraluminal compressive contents, such as air and feces. All CT criteria were compared in

different groups: appendicitis vs non-appendicitis or appendicitis vs PaID.

RESULTS

The optimal cutoff value of appendicitis was 8.2mm for MOD, 6.7mm for DWC, 1.7mm for MT with the areas under the ROC curve (AUC) of were 0.953, 0.971 and 0.688, respectively. In PaID, presence of MT, mural enhancement and periappendiceal infiltration was not significantly different from true appendicitis. Seventy-nine of 135 appendicitis (58.5%) and 122 of 228 non-appendicitis (53.5%) had MODs between 5.7mm to 11.3mm in region of overlap between two groups. In this region of overlap, the AUC of DWC was significantly higher than that of MOD ($p=0.001$). Using a criterion of DWC greater than 6.7mm yielded a sensitivity of 82.3% and a specificity of 82.0%. There were no other criteria with both sensitivity and specificity higher than 80%, but only appendicolith always showed highest specificity, greater than 90% regardless of MOD or presence of PaID.

CONCLUSION

The cutoff value of MOD should be revised or replaced by more accurate CT criteria. For appendices with PaID or borderline diameters, DWC is more reliable than MOD and the presence of appendicolith is helpful.

CLINICAL RELEVANCE/APPLICATION

For evaluation of equivocal cases of appendices, the CT criteria of DWC more than 6.7mm is reliable with presence of appendicolith.

ER223-SD- CT Pulmonary Angiography: One-Stop-Shop for Assessment of Severity and Prognosis in Acute TUA5 Pulmonary Embolism

Station #5

Participants

Vishal Agrawal, Bangalore, India (*Presenter*) Nothing to Disclose

Vaseemali J. Mulla, MBBS, DMRD, Gokak, India (*Abstract Co-Author*) Nothing to Disclose

Govindarajan J. Mallarajapatna, MBBS, MD, Bangalore, India (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Purpose: Assessment of severity and short term outcome (in-hospital mortality) on computed tomography pulmonary angiography (CTPA) in patients with acute pulmonary embolism.

METHOD AND MATERIALS

Consecutive 50 patients underwent computed tomography pulmonary angiography (CTPA) and diagnosed acute pulmonary embolism, were included in the study. CTPA images were evaluated for calculation of Pulmonary Artery Obstruction Index (PAOI) by Qanadli's method and cardiovascular measurements for evaluation of right ventricular dysfunction (RVD). All the patients were followed for outcome (survived or died) at the time of discharge from hospital.

RESULTS

We found, PAOI as predictor of severity of acute pulmonary embolism in the form of assessment of RVD. We also found that PAOI had statistically significant correlation with right ventricle (RV)/left ventricle (LV) ratio and Coronary sinus diameter in order to assess severity of acute pulmonary embolism. However, other CTPA parameters like main pulmonary artery(MPA)/ Aorta(Ao) diameter ratio, reflux of contrast into inferior vena cava (IVC) and interventricular septum (IVS) bowing towards LV were also found to predict RVD. We found, RV/LV ratio and superior vena cava (SVC) diameter as predictor of in-hospital mortality in patients with acute pulmonary embolism. However, other CTPA parameters like RV diameter, LV diameter, reflux of contrast in IVC and IVS bowing towards LV were also found to predict in-hospital mortality. PAOI was not able to predict in-hospital mortality. Cut-off values of RV/LV ratio and PAOI were found to be 1.6 (100% sensitivity, 100% specificity and accuracy 100%) and 50% (50% sensitivity, 93% specificity and accuracy 90%) respectively for predicting in-hospital mortality. Threshold value for SVC diameter was 20.5mm with equal sensitivity and specificity for predicting in-hospital mortality..

CONCLUSION

PAOI based on Qanadli's method, RV/LV ratio and coronary sinus diameter can be used as a predictor of severity in acute Pulmonary embolism. RV/LV ratio and SVC diameter as assessed at CTPA can be used as a potential tool to predict short term outcome (in-hospital mortality).

CLINICAL RELEVANCE/APPLICATION

CTPA is not only used for confirming diagnosis of acute pulmonary embolism but can also be used to assess severity and outcome in acute pulmonary embolism. So more appropriate treatment measures can be taken to modify the outcome in future.

Emergency Radiology Tuesday Poster Discussions

Tuesday, Dec. 1 12:45PM - 1:15PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Jamlik-Omari Johnson, MD, Atlanta, GA (*Moderator*) Nothing to Disclose

Sub-Events

ER224-SD- TUB1 Facial Fractures Necessitating Surgery: Do Radiologists and Surgeons Speak the Same Language?

Station #1

Participants

Erica Ludi, BS, Decatur, GA (*Presenter*) Nothing to Disclose

Saurabh Rohatgi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

Matthew E. Zygmunt, MD, Decatur, GA (*Abstract Co-Author*) Nothing to Disclose

Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

Tarek N. Hanna, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To examine the use and concordance of facial fracture classifications in trauma patients who underwent facial surgery

METHOD AND MATERIALS

Trauma patients who underwent facial computed tomography (CT) and inpatient facial operative intervention over a 1-year period were retrospectively analyzed. Demographics, injury severity score (ISS), radiology report, surgical diagnosis and indications were examined. Fractures were documented by bone, and further classified into sub-types: LeFort 1, 2, 3, naso-orbital-ethmoidal (NOE), zygomaticomaxillary (ZMC), orbital subtypes (floor, medial, lateral or roof) and mandibular subtypes (symphysis, parasymphysis, body, ramus, angle, condyle or coronoid process). Concordance between radiologic and surgical reports was assessed.

RESULTS

Of 115,000 Emergency Department visits there were 9,000 trauma activations in the year study period. 3326 facial CTs were performed (69.6% Male); 156 (4.7%) patients had facial surgical intervention. 23 cases were excluded due to incomplete chart data, leaving 133 cases (34.3 years, 86.5% Male). ISS average was 10.2 (range: 1-75). Top 3 injury mechanisms were assault (77, 57.9%), traffic accident (21, 15.8%) and fall (20, 15%). Top 3 facial bone fractures were: mandible (100, 75.2%), maxilla (53, 39.8%) and orbit (53, 39.8%). The top 5 classifications found in both radiology and operative report were mandibular angle (25), orbital floor (25), mandibular parasymphysis (22), mandibular body (21) and ZMC fractures (19). A classification was not given in 30 (22.5%) radiologic impressions with 28/30 radiologists expecting the surgeon to read the full report. Classifications in the full radiology and operative reports matched in 73 (56.4%) of cases and differed in 51 (38.3%). Of 51 reports that differed, 35 has discordant mandibular and orbital subtypes. In 16 of 51, the radiologist failed to classify the fracture type either in the findings or impression section of the report.

CONCLUSION

In 38.3% of patients needing facial surgery, radiologic and surgical descriptors differed. In certain cases, the surgeon had to read the full radiology report to assemble the classification themselves.

CLINICAL RELEVANCE/APPLICATION

Speaking a common language would improve communication between radiology and surgical services and may help expedite management of cases requiring surgery.

ER225-SD- TUB2 Measurement of Cardiac Output from Pulmonary Arterial Test Bolus Data for Application to CT Pulmonary Embolism Study Protocol

Station #2

Participants

Lauren Sawatzky, Vancouver, BC (*Presenter*) Nothing to Disclose

Nicolas J. Bilbey, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

Tim O'Connell, MD, Meng, Vancouver, BC (*Abstract Co-Author*) President, Resolve Radiologic Ltd; Speake, Siemens AG

Luck J. Louis, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to establish an accurate method for measuring cardiac output (CO) non-invasively using clinical data from pulmonary arterial enhancement in CT cardiac test bolus studies of patients with suspected pulmonary embolism.

METHOD AND MATERIALS

CT cardiac protocol test bolus studies from 22 patients (14 men, 8 women; mean age of 64.9±14.91) with suspected pulmonary embolism were retrospectively selected for analysis. Studies with a delayed image acquisition start time, incomplete pulmonary artery visualization due to motion artifact or inadequate imaging field depth were excluded from analysis. The average heart rate was 62.5±11.1 beats per minute. Time-enhancement curves were created using a circular ROI individually adjusted to the diameter

of the ascending aorta to measure mean enhancement and the change in contrast enhancement was plotted against time. Area under the time-enhancement curve (AUC) was calculated by numerical integration. A standard minimum incremental change in attenuation was set at 15% to delineate the start and end points of contrast administration. Stroke volume, ejection fraction, end diastolic volume, end systolic volume and cardiac output from each patient were obtained from cardiac functional assessment using Syngo.via software (Siemens). AUC was correlated with cardiac output using GraphPad statistical analysis.

RESULTS

Cardiac output and AUC correlated strongly with a Pearson's correlation coefficient (r) of -0.75 ($r^2 = 0.56$). The regression analysis yielded an equation of $AUC = -84.142 \times CO + 1233.2$ with a statistical significance of $p < 0.0001$.

CONCLUSION

Cardiac output can be accurately and non-invasively quantified from test bolus data using the AUC obtained from pulmonary arterial attenuation over time. Furthermore, AUC shows a strong correlation with cardiac output when applied to cardiac protocol study data in clinical practice. Cardiac output measured from pulmonary arterial test bolus data can be used to improve CT pulmonary embolism (CTPE) image studies through modification of contrast protocol.

CLINICAL RELEVANCE/APPLICATION

Accurate measurement of CO from clinically acquired test bolus data may fulfill a vital role in modifying contrast protocols for individual patients, improving diagnostic quality and patient care.

ER226-SD- TUB3 Assessment of Overutilization of CT Pulmonary Angiography to Detect Pulmonary Embolism in the Emergency Department and the Role of Age-adjusted Threshold for D-dimer

Station #3

Participants

Iman Khodarahmi, MD, PhD, Newark, NJ (*Presenter*) Nothing to Disclose
Cynthia Okoduwa, MD, Newark, NJ (*Abstract Co-Author*) Nothing to Disclose
Yasser Noorelahi, MBBS, East Rutherford, NJ (*Abstract Co-Author*) Nothing to Disclose
Pierre D. Maldjian, MD, West Caldwell, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether pretest probability assessment and D-dimer testing are being used effectively to determine the need for CT pulmonary angiography (CTPA) in diagnosing acute pulmonary embolism (PE). Also, to determine the efficacy of using an age-adjusted D-dimer cutoff to avoid unnecessary CTPA.

METHOD AND MATERIALS

The CTPA and electronic medical records of consecutive emergency department (ED) patients were retrospectively reviewed. Hemodynamically stable adult patients who presented to the ED were included in the study. Patients were categorized into low, intermediate and high pretest probability groups based on the Revised Geneva Score (RGS). Avoidable imaging which is defined according to the National Quality Forum as imaging in a patient with low pretest probability, who either did not have a D-dimer test ordered or who had a negative D-dimer, was determined. The effect of an age-adjusted D-dimer cutoff, defined as age \times 10 ng/mL for those 50 years or older, in patients with $RGS \leq 10$ was also investigated.

RESULTS

So far, a total of 100 patients have been included in this ongoing study of whom 27% had low, 68% had intermediate and 5% had high pretest probability to have PE. 10 patients had PE on CTPA, 2 in low risk, 5 in intermediate risk and 1 in high risk group. Of 27 low risk patients, 2 patients had low D-dimer and 14 patient did not undergo D-dimer testing, accounting for 16% prevalence of avoidable imaging. Implementing the age-adjusted cutoff for D-dimer in patients 50 years or older with $RGS \leq 10$ who underwent D-dimer testing could safely prevent unnecessary CTPA in 10% of the patients (95% CI, 0% - 28%).

CONCLUSION

Adherence to the established diagnostic protocols may lead to reduction in avoidable imaging rate in patients suspected for PE. Implementing an age-adjusted cutoff for D-dimer suggests improvement in avoiding unnecessary CTPA, although low sample size is a limitation to our pilot study to generalize the results.

CLINICAL RELEVANCE/APPLICATION

This ongoing study determines the rate of avoidable CTPA and can assess the efficacy and safety of using an age-adjusted D-dimer cutoff to exclude suspected pulmonary embolism.

ER227-SD- TUB4 Comparison of Filtered Back Projection and Iterative Reconstruction in Diagnosing Appendicitis at 2-mSv CT

Station #4

Participants

Ji Hoon Park, MD, Seongnam-Si, Korea, Republic Of (*Presenter*) Research Grant, Bracco Group
Bohyoung Kim, PhD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mi Sung Kim, MD, Koyang, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyuk Jung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yousun Ko, MPH, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soyeon Ahn, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Murat Karul, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Joel G. Fletcher, MD, Rochester, MN (*Abstract Co-Author*) Grant, Siemens AG; ;
Kyoung Ho Lee, MD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare radiologists' diagnostic performance, confidence, and subjective image quality between filtered back projection (FBP)

to compare radiologists' diagnostic performance, confidence, and subjective image quality, between filtered back projection (FBP) and iterative reconstruction (IR) at 2-mSv appendiceal CT.

METHOD AND MATERIALS

The institutional review board approved this retrospective study and waived the requirement for informed consent. We included 107 adolescents and young adults (age, 30.0 ± 8.5 years; 64 females) undergoing 2-mSv CT for suspected appendicitis. Appendicitis was confirmed in 42 patients. Seven readers with different experience levels reviewed the CT images reconstructed using FBP and IR (iDose4, Philips). They rated both the likelihood of appendicitis and subjective image quality on 5-point Likert scales. We used receiver operating characteristic analyses, Wilcoxon's signed-rank tests, and McNemar's tests.

RESULTS

The pooled area under the receiver operating characteristic curve (AUC) was 0.96 for both FBP and IR (95% CI for the difference, -0.02, 0.02; $P = .73$). The AUC difference was not significant in any of the individual readers ($P \geq .21$). For the majority of the readers, the diagnostic confidence in terms of the likelihood of appendicitis was not significantly different between the two reconstruction methods. Subjective image quality tended to be higher with IR for all readers ($P \leq .70$), showing significant differences for four readers ($P \leq .040$).

CONCLUSION

FBP and IR are comparable in radiologists' diagnostic performance and confidence. Higher subjective image quality of IR does not translate into an improvement in diagnostic performance or confidence.

CLINICAL RELEVANCE/APPLICATION

At an effective dose (2 mSv) similar to annual natural background radiation, appendiceal CT can be performed with FBP or IR with similar diagnostic performance and confidence.

ER228-SD-TUB5 Multivariate Analysis of Cardiovascular Parameters in CT Pulmonary Angiography for Risk Stratification: A Predictive Model for Signs of Right Heart Dysfunction

Station #5

Participants

Ludo F. Beenen, MD, Amsterdam, Netherlands (*Presenter*) Nothing to Disclose

Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC

Jaap Stoker, MD, PhD, Amsterdam, Netherlands (*Abstract Co-Author*) Research Consultant, Robarts Clinical Trials

Harry R. Buller, MD, PhD, Amsterdam, Netherlands (*Abstract Co-Author*) Consultant, Bayer AG; Consultant, Bristol-Myers Squibb Company; Consultant, Boehringer Ingelheim GmbH; Consultant, Isis Pharmaceuticals, Inc; Consultant, ThromboGenics NV; Research support, Bayer AG; Research support, Pfizer Inc

Saskia Middeldorp, Amsterdam, Netherlands (*Abstract Co-Author*) Consultant, Bayer AG; Consultant, Bristol-Myers Squibb Company; Research support, GlaxoSmithKline plc; Research support, Bristol-Myers Squibb Company; Research support, Pfizer Inc; Research support, Sanquin; Speaker, Bayer AG; Speaker, GlaxoSmithKline plc; Speaker, Bristol-Myers Squibb Company

PURPOSE

In patients with acute pulmonary embolism (PE) in multiple studies a variety of radiological parameters are reported to be associated with right ventricular dysfunction (RVD) and outcome. However, which items are most helpful for risk stratification is unclear. We aimed to assess the predictive value of these radiological parameters on prognosis in correlation with RVD.

METHOD AND MATERIALS

We evaluated baseline CT Pulmonary Angiography scans in 1950 patients with PE participating in an international RCT comparing two anticoagulant regimens. The following parameters were prospectively assessed on axial CT slices: ratio of maximum right and left ventricle diameters (RV/LV ratio), and maximum diameters of the pulmonary trunk and the azygos, superior (SVC) and inferior caval vein (IVC). The presence of septal bowing and intrahepatic backflow of contrast medium was also assessed. For outcome an elevated serum NT-proBNP ≥ 500 (biomarker of cardiac failure) was considered to represent RVD. Univariate regression analysis followed by a forward stepwise multivariate logistic regression was performed to derive predictors for RVD. A p-value < 0.05 was considered statistically significant.

RESULTS

In total 548 patients (29.3%) had an elevated NT-proBNP. Univariate analysis showed in decreasing strength a significant correlation with increased RV/LV ratio, pulmonary trunk dilatation, septal bowing, intrahepatic back flow, SVC, azygos vein and IVC diameters. In the multivariate analysis the RV/LV ratio, followed by intrahepatic back flow, pulmonary trunk dilatation, SVC, and septal bowing were contributing factors for predictive model building. The diameters of azygos vein, and IVC did not contribute to the model. Nagelkerke's R^2 increased respectively from 0.291-0.300-0.339-0.362-0.377 to 0.383 (complete model).

CONCLUSION

The RV/LV ratio, intrahepatic backflow, enlarged pulmonary trunk, SVC and septal bowing are contributing predictive factors in a model for RVD. This combination yields a higher correlation with RVD than either factor alone.

CLINICAL RELEVANCE/APPLICATION

A predictive model for right ventricular dysfunction considering multiple CT parameters is most promising for risk stratification, tailoring the need for aggressive therapy.

Emergency Radiology (Chest Emergencies)

Tuesday, Dec. 1 3:00PM - 4:00PM Location: N227



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Martin L. Gunn, MBChB, Seattle, WA (*Moderator*) Research support, Koninklijke Philips NV; Spouse, Consultant, Wolters Kluwer NV; Medical Advisor, TransformativeMed, Inc;
Mariano Scaglione, MD, Castel Volturno, Italy (*Moderator*) Nothing to Disclose

Sub-Events**SSJ06-01 Predicting Pulmonary Embolus in ED Patients with Isolated Below-the-Knee Deep Vein Thrombosis**

Tuesday, Dec. 1 3:00PM - 3:10PM Location: N227

Awards**Trainee Research Prize - Resident****Participants**

Alexander S. Misono, MD, MBA, Boston, MA (*Presenter*) Nothing to Disclose
Rahmi Oklu, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ali Raja, MD, MBA, Brookline, MA (*Abstract Co-Author*) Medical Advisor, Diagnostics, LLC
Anand M. Prabhakar, MD, Somerville, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Existing literature is mixed regarding risk of isolated below-the-knee deep vein thrombosis (BKDVT) relating to development of pulmonary embolus (PE). Patients with acuity of symptoms triggering an emergency department (ED) visit may be at higher risk. This study aims to quantify and characterize the risk of PE in ED patients found to have BKDVT.

METHOD AND MATERIALS

In this IRB-approved, HIPAA compliant study, ED lower extremity ultrasounds from 2005-2015 were reviewed to identify patients with isolated BKDVT. Medical records were reviewed for either PE protocol or conventional protocol chest CT within 1 month of the index ultrasound to assess for PE. Key clinical factors at presentation were determined, including venous territories involved and history of DVT, malignancy, medical risk factors (e.g. smoking, genetic predisposition, medications, travel), recent surgery/hospitalization, and respiratory symptoms/pain. Chi Square test was performed to compare utility of clinical factors in assessing risk of PE in patients with BKDVT, with statistical significance set at $p < 0.05$.

RESULTS

135 studies were identified with isolated BKDVT, with patients of average age 57.1 ± 17.2 (mean \pm SD) with a range of 21-93, including 51% male, 49% female. BKDVT was identified in the posterior tibial (50%), peroneal (42%), gastrocnemius (19%), anterior tibial (2%), and soleal (1%) veins. Patients either had 1 (84%) or 2 territories (16%) involved, with 8% bilateral. 50 patients (37%) underwent chest CT in the prescribed period. No difference was seen in age ($p = .232$), gender ($p = .774$), or territories involved ($p = .830$) in those who underwent CT versus those who did not. Of those with CT, 31 (62%) had PE. Presence of two territories (e.g. posterior tibial and peroneal) was associated with higher likelihood of PE ($p = 0.018$). Other clinical factors were not meaningful, including history of DVT ($p = .232$), malignancy ($p = .756$), medical risk factors ($p = .255$), recent surgery/hospitalization ($p = 1.00$), symptoms ($p = .773$), and bilaterality ($p = .637$).

CONCLUSION

ED patients presenting with isolated BKDVT have a very high incidence (62%) of concurrent PE. While the utility of predictive factors is limited due to this high incidence, presence of BKDVT in two venous territories was highly associated with PE.

CLINICAL RELEVANCE/APPLICATION

ED patients with isolated below-the-knee deep vein thrombosis have a much higher rate of PE than traditionally expected.

SSJ06-02 Ultra-low-dose Chest CT with Iterative Reconstructions vs Chest X-Ray in Emergency Settings. Is it the Beginning of a New Era? Preliminary Observations

Tuesday, Dec. 1 3:10PM - 3:20PM Location: N227

Participants

Francesco Macri, MD, Nimes, France (*Presenter*) Nothing to Disclose
Joel Greffier, Nimes, France (*Abstract Co-Author*) Nothing to Disclose
Alina Chica Rosa, MD, Nimes, France (*Abstract Co-Author*) Nothing to Disclose
Cornelia Freitag, Nimes, France (*Abstract Co-Author*) Nothing to Disclose
Gian Franco Gualdi, MD, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Ahmed Larbi, MD, Nimes, France (*Abstract Co-Author*) Nothing to Disclose
Jean-Paul Beregi, MD, Nimes, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic power of the ultra-low-dose CT (ULD-CT) of the chest compared to the chest X-ray (CXR) at the emergency room (ER).

METHOD AND MATERIALS

Patients with dubious CXR performed at the ER searching for pneumothorax, fractures and pneumopathy who underwent a ULD-CT within 48 hours. ULD-CT acquisition was performed on a 64 slices MDCT (Somatom Definition AS+, Siemens) with 100 kVp \pm 20 (depending on the patient constitution) and fixed 10 mAs, without injection of intravenous iodinated contrast media. Images were reconstructed with Sinogram-Affirmed-Iterative-Reconstructions (SAFIRE, Siemens) with S4 and I50f for pulmonary parenchyma and with S3 and I30f for the mediastinum. A radio-physicist evaluated the dose differences between CXR and ULD-CT. Two radiologists independently evaluated the diagnostic quality of the images and the diagnostic degree of confidence.

RESULTS

A total of 136 patients (M 72; F 64) with a mean age of 63 years (\pm 20.5) and a mean BMI 23.6 kg/m² (\pm 5.1) were enrolled. The effective dose for CXR was 0.133 \pm 0.132 mSv, 59% lower than CXR french Diagnostic Reference Levels (fDRL): 0.225 mSv. The effective dose for ULD-CT was 0.189 \pm 0.035 mSv, 97% lower than chest CT fDRL: 6.65 mSv. ULD-CT revealed a higher quantity of small pneumothoraxes and fractures and better depicted the pneumopaties compared to CXR. Readers recorded a high score of diagnostic confidence level for ULD-CT. Diagnostic decision-making was possible even on noisy CT images.

CONCLUSION

ULD-CT with iterative reconstructions, with an irradiation dose close to CXR, allowed a reliable study of the patients with the suspicion of pneumothorax, fractures and pneumopathy.

CLINICAL RELEVANCE/APPLICATION

Ultra-low-dose chest CT with iterative reconstructions improves the management of the ER patients with suspicion of pneumothorax, fractures and pneumopathy by reducing the delay of diagnosis and avoiding redundant exposure.

SSJ06-03 Dual-Energy CT of Chest in Pulmonary Angiography: Maximizing Optimal Contrast Enhancement with a Non-Linear Blending Technique

Tuesday, Dec. 1 3:20PM - 3:30PM Location: N227

Participants

Teresa I. Liang, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Ismail T. Ali, MBChB, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Memoona Mian, MD, FRCR, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

CT Pulmonary angiography (CT PE) is the gold standard for diagnosis of pulmonary emboli (PE). However, in suboptimal conditions, contrast enhancement is inadequate for diagnostic purposes, and scans often need to be repeated. In this study we evaluate the utility of Dual Energy CT (DECT PE) non-linear blending technique in patients with suspected PE in comparison to a standard 100 kVp scan.

METHOD AND MATERIALS

Thirty-five patients between September 19, 2013 and 2014 with a suspected PE, underwent a standardized high-pitch DECT PE protocol to generate standard 100kVp (DECT-100) and non-linear blended images (DECT-OC). Visualization of the pulmonary arteries on the two image sets was scored on a Likert scale from 1 to 5 by two readers (Score of 5 = excellent sharp visualization of anatomical structures, no image noise and artifacts; score of 1 = poor visualization of anatomical structures, and severe image noise and artifacts). Each segment was assessed for diagnostic ability of possible PE. Mean and standard deviation of CT values within pulmonary arteries, muscle, and air were recorded, and signal to noise (SNR) and contrast to noise (CNR) ratios were generated as a quantitative index of image quality. Student t-test and Wilcoxon rank sum test were used for statistical analysis, and $p < 0.05$ was considered significant.

RESULTS

Visualization scores were significantly better on all segments (Main, left and right, lobar, segmental and subsegmental pulmonary arteries) on the DECT-OC images for both readers ($p < 0.0001$). In the 490 pulmonary artery segments evaluated, 34 were non-diagnostic on the DECT-100 images, whereas only 7 were non-diagnostic on the DECT-OC images ($p < 0.0001$). Mean SNR was 97% higher (27.67 vs. 54.53, $p < 0.0001$) and mean CNR was 105% higher (14.76 vs 30.27, $p < 0.0001$) on the DECT-OC images.

CONCLUSION

The application of a DECT non-linear blending technique for the diagnosis of PE helps significantly improve SNR, CNR, and arterial visualization in comparison to a standard 100 kVp protocol, yielding substantially improved diagnostic image quality.

CLINICAL RELEVANCE/APPLICATION

Non-linear blended DECT PE allows optimal visualization of the pulmonary vasculature leading to improved detection of PE, and may be especially useful in suboptimal studies to avoid repeat scans.

SSJ06-04 Sickie Cell Patients Undergoing CT Pulmonary Angiography in the Emergency Department: An Analysis

Tuesday, Dec. 1 3:30PM - 3:40PM Location: N227

Participants

David D. Bates, MD, Boston, MA (*Presenter*) Nothing to Disclose
Z Liu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Nagaraj-Setty Holalkere, MD, Boston, MA (*Abstract Co-Author*) Owner, imaginglink, LLC

PURPOSE

To analyze the data for patients with sickle cell disease being evaluated in the emergency department with CT pulmonary angiography.

METHOD AND MATERIALS

This retrospective study was approved by our Institutional Review Board. Patients with sickle cell disease were evaluated with CT pulmonary angiography (CTPA) 42 times in the Emergency Department over 26 months beginning in November 2011. Clinical data and imaging were reviewed and compared with patients from the same period. Studies were classified as positive for acute pulmonary embolus, negative for acute pulmonary embolus, or indeterminate. Wells' scores were calculated for each sickle patient as well as a control group based on the medical records. Statistical analysis was performed.

RESULTS

Patients with sickle cell undergoing CTPA in the emergency department were significantly more likely to have either 'Moderate' or 'High' risk Wells' scores (53.7% vs. 31.0, $p < 0.05$), more likely to be female (76.19% vs. 62.79%, $p < 0.05$), and had lower mean age (31.74 vs. 55.26 years, $p < 0.05$). No statistically significant difference was observed for the rate of acute PE between sickle cell patients and the ER population (7.14% vs. 10.67%).

CONCLUSION

Sickle cell patients are younger and are more likely to be female than the general population of patients undergoing CTPA in the ED. Sickle cell patients are also more likely to be categorized as either 'Moderate' or 'High' risk based on Wells' Criteria than a control group. No significant difference in the rate of acute PE was observed for sickle patients compared with the general population of patients when undergoing CTPA in the ED.

CLINICAL RELEVANCE/APPLICATION

Sickle cell patients are younger, more likely to be female and more likely to be classified as Moderate or High Risk based on Wells' criteria when being evaluated with CTPA in the emergency department (ED). Despite the higher risk profile, no difference was observed in the rate of acute PE for sickle cell patients, though the small sample size limits sensitivity for the detection of a true difference in the incidence of acute PE. Younger and female, sickle cell patients as a group may be at higher risk for the stochastic effects of ionizing radiation. Our study suggests that risk stratification models used in clinical decision pathways for the evaluation of PE in the general population may not be appropriate for use in sickle cell patients.

SSJ06-05 The Impact of Maximum Aortic Wall Thickness on Patient Outcomes in Acute Type A Intramural Hematoma

Tuesday, Dec. 1 3:40PM - 3:50PM Location: N227

Participants

Michael K. Atalay, MD, PhD, Providence, RI (*Presenter*) Nothing to Disclose
Ashley A. Tuttle, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Grayson L. Baird, MS, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Dennis Kwon, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Neel Sodha, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Aortic intramural hematoma (IMH) is an uncommon acute aortic injury that can heal spontaneously or progress to potentially life-threatening complications. Maximum IMH thickness (Tmax) and luminal compression ratio (LCR) have been proposed as potentially useful metrics for identifying patients who are more likely to experience complications. The aim of this study was to correlate Tmax and LCR with patient outcomes in all Type A IMH cases performed in a large tertiary referral center over 11 years.

RESULTS

Over the study period, 54 thoracic IMH cases were captured in PACS, 23 (43%) of which were Type A and 31 (57%) Type B. Mean Type A patient age was 77 ± 12 years and 13 (57%) of the 23 patients were female. Outcomes in 7 patients were unknown (1 Type A, 6 Type B). Of those remaining, 7 (32%) Type A cases and 10 (40%) Type B cases showed regression on serial follow-up imaging. A significant interaction for regression was observed for IMH Type and Tmax ($p=0.039$). For each millimeter increase in Tmax the odds of regression for Type A IMH decreased 26%. The Tmax for 50% probability of Type A regression was 8.6 mm. The mean Tmax for those Type A cases showing regression was 8.6 mm and for those showing progression 14.6 mm ($p=0.015$). There was no significant correlation between LCR or Dmax and patient outcomes for Type A IMH.

CONCLUSION

Maximal aortic wall thickness predicts the odds of spontaneous resolution or stability of Type A IMH and may in turn impact clinical management.

CLINICAL RELEVANCE/APPLICATION

The maximal aortic wall thickness in Type A IMH may potentially be used as a metric for adverse outcomes to guide medical versus surgical management.

SSJ06-06 Effect of Patient Lung Volume on Contrast Volume Administration During Computed Tomography Pulmonary Angiography

Tuesday, Dec. 1 3:50PM - 4:00PM Location: N227

Participants

Charbel Saade, PhD, Beirut, Lebanon (*Presenter*) Nothing to Disclose
Fadi M. El-Merhi, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Mukbil H. Hourani, MD, Beirut, Lebanon (*Abstract Co-Author*) Nothing to Disclose
Hussain Al-Mohiy, Abha, Saudi Arabia (*Abstract Co-Author*) Nothing to Disclose
Bassam El-Achkar, MD, Beirut, Lebanon (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the effect of patient lung volume and contrast volume on pulmonary artery opacification using a patient-specific contrast formula during pulmonary multidetector CT angiography.

METHOD AND MATERIALS

IRB approval for this prospective study was obtained. CTPA was performed on 120 patients with suspected PE using a 64-channel computed tomography scanner and a dual-barrel contrast injector. Patients, were assigned to two protocol groups: protocol A, the department's conventional protocol, employed a fixed 80 mL contrast volume, intravenously injected at 4.5 mL/s; protocol B used a patient-specific contrast formula based on patient cardiovascular dynamics. Both protocols used a 50 mL saline flush at 4.5 mL/s and a craniocaudal scan direction. The mean cross-sectional opacification profile of eight central and eleven peripheral pulmonary arteries and veins were measured for each patient and arteriovenous contrast ratio (AVCR) calculated for each lung segment. Mean lung volume were quantified using a computer aided detection software. Protocols were compared using Mann-Whitney U non-parametric statistics. Inter-observer variations were investigated using Kappa methods.

RESULTS

: A number of pulmonary arteries demonstrated increases in opacification ($p < 0.03$) for protocol B compared with A whilst opacification in the heart and all veins was reduced in protocol B ($p = 0.05$). Subsequently, increased AVCR in protocol B compared with A was observed at all anatomic locations ($p < 0.0002$) where this ratio was calculated. Mean contrast volume demonstrated a reduction in protocol B (33 ± 9 mL) compared to A (80 ± 1 mL). In protocol B larger lung volumes were significantly correlated to larger volumes of contrast ($p < 0.03$). Inter-observer variation was observed with protocol B compared with A with the latter metric increasing from $\kappa = 0.28$ to 0.71 respectively.

CONCLUSION

Significant improvements in visualisation of the pulmonary vasculature can be achieved with low contrast volume. Patient lung volume is significantly correlated to contrast volume administration employing a patient-specific contrast formula.

CLINICAL RELEVANCE/APPLICATION

Matching patient lung volume and contrast injection timing with vessel dynamics significantly improves vessel opacification and reduces contrast dose in the assessment of pulmonary embolism (PE) during computed tomography pulmonary angiography (CTPA).

RC408

Emergency Neuroradiology (An Interactive Session)

Tuesday, Dec. 1 4:30PM - 6:00PM Location: E353B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC408A Imaging of Non-traumatic Intracranial Hemorrhage

Participants

Diego B. Nunez JR, MD, MPH, New Haven, CT, (diego.nunez@yale.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate the imaging patterns of non-traumatic intracranial hemorrhage on initial presentation. 2) Recognize opportunities for providing a more precise diagnosis based on the initial CT findings. 3) Define and recommend the best additional imaging approach for appropriate patient management.

RC408B Imaging of Spine Infection

Participants

Wayne S. Kubal, MD, Tucson, AZ (*Presenter*) Stockholder, Stryker Corporation; Stockholder, Sarepta Therapeutics Inc; Stockholder, CVS Health Corporation

LEARNING OBJECTIVES

1) Understand how pathophysiology and anatomy determine the imaging appearance of spine infection. 2) Critically assess which imaging options offer the greatest sensitivity for both initial diagnosis and post treatment assessment of spine infection. 3) Be able to differentiate spine infection from common mimics most notably degenerative disease.

RC408C Imaging of Cervical Spine Trauma

Participants

Stuart E. Mirvis, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize circumstances in which MRI is indicated for blunt cervical spine trauma. 2) Be familiar with the spectrum of radiologic findings associated with atlanto-occipital dissociation injuries. 3) Understand similarity in appearance and methods to distinguish stable from unstable hyperflexion injuries. 4) Know association of cervical spine injury patterns with vertebral artery injury.

ABSTRACT

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Stuart E. Mirvis, MD - 2015 Honored Educator

Emergency Radiology Wednesday Case of the Day

Wednesday, Dec. 2 7:00AM - 11:59PM Location: Case of Day, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to Disclose
 Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Melanie Wegener, Garden City, NY (*Abstract Co-Author*) Nothing to Disclose
 Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
 Ania Z. Kielar, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
 Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
 Puneet Bhargava, MD, Shoreline, WA (*Abstract Co-Author*) Editor, Reed Elsevier
 Nicholas M. Beckmann, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Ritu Bordia, MBBS, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Recognize key imaging findings on multimodality imaging of emergency/trauma patients. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Recommend appropriate management including image-guided interventions.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator
 Douglas S. Katz, MD - 2013 Honored Educator
 Douglas S. Katz, MD - 2015 Honored Educator
 Puneet Bhargava, MD - 2015 Honored Educator

RSNA/ESR Emergency Symposium: CNS Emergencies (An Interactive Session)

Wednesday, Dec. 2 8:30AM - 10:00AM Location: S402AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Moderator*) Nothing to Disclose
Andras Palko, MD, PhD, Szeged, Hungary (*Moderator*) Medical Advisory Board, Affidea Group;

Sub-Events**MSSR41A CNS Trauma and Neurovascular Injury****Participants**

Howard A. Rowley, MD, Madison, WI, (hrowley@uwhealth.org) (*Presenter*) Research Consultant, Bracco Group; Research Consultant, Guerbet SA; Research Consultant, General Electric Company; Consultant, F. Hoffmann-La Roche Ltd; Consultant, W.L. Gore & Associates, Inc; Consultant, Lundbeck Group; ; ; ; ;

LEARNING OBJECTIVES

1) To be familiar with traumatic brain injury demographics and classification schemes. 2) Be able to apply appropriateness criteria for head trauma imaging in children and adults. 3) Identify key imaging patterns and pitfalls in the evaluation of brain and neurovascular trauma.

ABSTRACT

This lecture on CNS Trauma and Neurovascular Injury is divided into 4 parts: Part 1 will briefly review traumatic brain injury (TBI) demographics and the most common TBI classification schemes; Part 2 will discuss the current imaging approach to acute TBI in clinical practice. Part 3 will illustrate the imaging manifestations of the different injuries located in the extra-axial space (e.g., scalp and skull injury; epidural, subdural, subarachnoid and intraventricular collections), and the intra-axial space (e.g., dysautoregulation, contusion, hematoma, penetrating TBI, axonal injury, fat emboli). Part 4 will review traumatic neurovascular injuries and fracture patterns correlated with high risk of vascular injury.

MSSR41B CNS Non-Traumatic Emergencies**Participants**

Marion Smits, MD, PhD, Rotterdam, Netherlands, (marion.smits@erasmusmc.nl) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To know the modalities (CT/MRI) and protocols for non-traumatic neurological emergencies. 2) To know and diagnose the main non-traumatic neurological vascular and non-vascular emergencies. 3) To be aware of the pitfalls and limitations of clinical presentation and imaging findings in non-traumatic neurological emergencies.

ABSTRACT

Neurological emergencies are often associated with high morbidity and mortality, and thus require prompt diagnostic and therapeutic action. Non-traumatic emergencies may however have a subacute onset, and radiological signs may be subtle, which can lead to delay in diagnosis and treatment. Since clinical features are often nonspecific, the radiologist may be the first to point the clinician in the direction of the correct diagnosis. It is therefore of great importance that the radiologist is aware of and familiar with the various imaging findings, on both computed tomography (CT) and magnetic resonance imaging (MRI), of non-traumatic neurological emergencies. These include vascular, infectious and inflammatory diseases. Commonly encountered emergencies are ischaemic and haemorrhage stroke, venous thrombosis, arterial dissection, abscess, acute disseminated encephalomyelitis (ADEM), and encephalitis. Radiological findings in rarer diseases may mimic those in the more commonly occurring diseases, but need to be correctly interpreted as therapeutic strategies and prognosis may be entirely different. Such entities include for instance posterior reversible encephalopathy syndrome (PRES), reversible cerebral vasoconstriction syndrome, Susac's syndrome, and status epilepticus. Furthermore, initial findings of (impending) complications of brain disease, such as hydrocephalus and herniation of brain structures, may be subtle, while early recognition allows for prompt and adequate intervention. Finally, diagnostic and therapeutic interventions performed in an emergency setting may interfere with the diagnosis and interpretation of clinical and imaging findings. Associated limitations and pitfalls therefore need to be recognised to avoid false negative or false positive diagnosis respectively.

MSSR41C Interactive Case Discussion**Participants**

Howard A. Rowley, MD, Madison, WI (*Presenter*) Research Consultant, Bracco Group; Research Consultant, Guerbet SA; Research Consultant, General Electric Company; Consultant, F. Hoffmann-La Roche Ltd; Consultant, W.L. Gore & Associates, Inc; Consultant, Lundbeck Group; ; ; ; ;
Marion Smits, MD, PhD, Rotterdam, Netherlands, (marion.smits@erasmusmc.nl) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review traumatic brain injury (TBI) and non-traumatic neurological emergencies. 2) To describe imaging manifestations of TBI and non-traumatic neurological emergencies. 3) To understand the clinical implications of radiological imaging findings in TBI and

non-traumatic neurological emergencies. 4) To know the state-of-the-art radiological imaging options for the assessment of acute TBI and non-traumatic neurological emergencies.

ABSTRACT

This interactive case discussion builds on the two previous lectures in this session, on traumatic and non-traumatic neurological emergencies respectively. Both lecturers will take the audience through several clinical cases, highlighting and emphasizing important issues from their lectures, such that the previously presented theory is placed in a clinical context. Preferably, the participants will have attended the two prior lectures, to optimally benefit from and participate in this interactive case discussion.

RC508

Trauma Imaging Pitfalls

Wednesday, Dec. 2 8:30AM - 10:00AM Location: E353C

ER

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC508A Chest Trauma Imaging Pitfalls

Participants

Felipe Munera, MD, Miami, FL, (fmunera@med.miami.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the MDCT findings of Aortic Diaphragmatic injuries. 2) Describe potential diagnostic pitfalls and mimics aortic and diaphragmatic injuries.

ABSTRACT

Thoracic injuries are the third most common injuries in blunt trauma. The purpose of this lecture is not an exhaustive review of all the potential traumatic thoracic injuries but rather to focus on two areas of particular concern, acute traumatic aortic injury and diaphragmatic injuries. Key imaging findings and potential pitfalls in recognizing blunt and penetrating traumatic injuries to the diaphragm and thoracic aorta will be discussed. Diagnosing aortic and diaphragmatic injuries each present unique challenges. Recognition of traumatic aortic and diaphragmatic injuries is important to allow for timely treatment, as delays in diagnosis can lead to increased morbidity and mortality.

RC508B Abdominal Trauma Imaging Pitfalls

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON, (patlas@hhsc.ca) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss common pitfalls in interpretation of cases of blunt and penetrating abdominal trauma. 2) To analyze factors leading to errors. 3) To discuss advantages of different phases of imaging and multiplanar reconstructions (MPRs) for detection of traumatic injuries.

ABSTRACT

MDCT have led to a paradigm shift in the management of abdominal injuries minimizing the role of laparotomy. To this end, an awareness of pitfalls of MDCT detection of these injuries is of increasing importance. Bowel and mesenteric injuries are uncommon. Delayed diagnosis of bowel and mesenteric injuries may result in disastrous complications and high mortality rates. This presentation will focus on imaging pearls and pitfalls in detection of blunt and penetrating bowel and mesenteric injuries. The presentation will also cover pitfalls in diagnosis of pancreatic, biliary, adrenal and ureteric injuries.

RC508C Pelvic Trauma Imaging Pitfalls

Participants

Guillermo P. Sangster, MD, Shreveport, LA, (gsangs@lsuhsc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss potential imaging pitfalls and mimics that may be misinterpreted as traumatic pelvic injuries. 2) Substantiate the advantages of Multidetector computed tomography (MDCT) for the screening of stable patients suspected to have traumatic pelvic injuries. 3) Differentiate intra and extraperitoneal pelvic injuries in patients suffering blunt and penetrating trauma.

ABSTRACT

Pelvis traumatic injuries range from benign to life threatening conditions. MDCT is the imaging modality of choice for evaluation of hemodynamically stable patients with pelvic trauma. This live activity demonstrates the benefits of MDCT in the detection and pre-operative planning of patients sustaining pelvic injuries. Subtle signs should be recognized for timely diagnosis, and familiarity with potential mimics is key to avoid unnecessary procedures.

RC508D Extremity Trauma Imaging Pitfalls

Participants

O. Clark West, MD, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify extremity injuries that are difficult to detect on screening radiographs. 2) Illustrate search patterns that may improve detection of easily missed injuries. 3) Design clinical pathways using advanced imaging and/or follow-up radiography to detect radiographically occult injuries.

ABSTRACT

Take home messages:•Posterior shoulder dislocation: narrow gleno-humeral joint, loss of parallel articular surfaces, fixed internal rotation on multiple views and trough impaction fracture. •Supracondylar fracture: anterior humeral line should intersect middle 50% of capitellum on well positioned lateral view. •Monteggia fracture-dislocation: radio-capitellar line should intersect the capitellum in ALL projections •Proximal radius-Vertical head fracture (external oblique view)-Impacted neck fracture-Flipped radial head fracture-dislocation •Galeazzi fracture-dislocation - beware ascribing DRUJ dislocation to poor positioning of lateral radiograph. For trauma, obtain 3 views of joints: •Axillary view of shoulder •External oblique of elbow •Wrist 4 view: PA, lateral, external oblique and "Scaphoid" view (ulnar deviated PA view) •Pearl for the day: watch for the least obvious of multiple injuries

Handout: O. Clark West

http://abstract.rsna.org/uploads/2015/15003347/WestOC_Trauma Imaging Pitfalls Upper Extremity_RSNA 2015 Handout.pdf

MSCP42

Case-based Review of Pediatric Radiology (An Interactive Session)

Wednesday, Dec. 2 10:30AM - 12:00PM Location: S406A



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sudha A. Anupindi, MD, Philadelphia, PA (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) To apply a systematic approach in the evaluation of pediatric diseases. 2) To identify essential imaging features of various pediatric congenital, musculoskeletal, abdominal and neurological diseases using a multimodality approach. 3) To understand and develop best imaging practice for various pediatric diseases.

ABSTRACT

To apply a systematic approach in the evaluation of pediatric diseases To identify essential imaging features of various pediatric congenital, musculoskeletal, abdominal and neurological diseases using a multimodality approach To understand and develop best imaging practice for various pediatric diseases

Sub-Events

MSCP42A Pediatric Brain Abnormalities

Participants

Manohar M. Shroff, MD, Toronto, ON, (manohar.shroff@sickkids.ca) (*Presenter*) Consultant, Guerbet SA; Consultant, Magellan Health, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

MSCP42B Pediatric Sport Injuries

Participants

Kirsten Ecklund, MD, Boston, MA, (kirsten.ecklund@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

MSCP42C Pediatric Nuclear Medicine Cases

Participants

Ruth Lim, MD, Boston, MA (*Presenter*) Consultant, Alexion Pharmaceuticals, Inc; Officer, New England PET Imaging System

LEARNING OBJECTIVES

View learning objectives under main course title.

RSNA/ESR Emergency Symposium: Chest Emergencies (An Interactive Session)

Wednesday, Dec. 2 10:30AM - 12:00PM Location: S402AB



AMA PRA Category 1 Credits™: 1.50
 ARRT Category A+ Credits: 1.50

Participants

Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Moderator*) Nothing to Disclose
 Andras Palko, MD, PhD, Szeged, Hungary (*Moderator*) Medical Advisory Board, Affidea Group;

Sub-Events**MSSR42A Thoracic Injuries****Participants**

Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize the most common vascular injuries seen in the setting of blunt thoracic trauma. 2) To understand the importance of differentiating traumatic aortic injuries from mimics, especially congenital variants. 3) To present a classification scheme that distinguishes between minor and major aortic injuries and how this classification influences patient management. 4) Illustrate with examples other important injuries resulting from chest trauma: major airways, heart, lung parenchyma, pleura and diaphragm.

ABSTRACT

Vascular injuries caused by blunt or penetrating trauma are common and highly lethal. In patients who survive the initial event, rapid evaluation with CT may be life saving. This presentation will focus on the importance of recognizing the CT signs used to diagnose major and minor aortic injuries and will introduce a classification method that helps direct patient management. Other important injuries that the radiologist needs to be aware of will also be reviewed, such as those affecting the major airways, heart and diaphragm. The emerging role of CT in the management of penetrating thoracic trauma will also be discussed. Finally, examples illustrating potential pitfalls leading to false-negative or false-positive interpretations will be highlighted.

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator

MSSR42B Non-Traumatic Thoracic Emergencies**Participants**

Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Presenter*) Advisory Board, Riverain Technologies, LLC

LEARNING OBJECTIVES

1) To get familiar with protocols and diagnostic performance of comprehensive cardiothoracic CT examinations to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and pulmonary embolism. 2) To illustrate typical but also less classic CXR and CT findings of patients with pulmonary or mediastinal diseases causing acute dyspnoea and / or requiring immediate treatment and to learn about key imaging findings in these patients allowing for a fast differential diagnosis. 3) To learn how to adapt CT protocols to CXR findings and to integrate imaging findings with lab findings, patient history and clinical information for making the diagnosis.

ABSTRACT

Pulmonary symptoms such as chest pain, shortness of breath or wheezing are common non-traumatic symptoms prompting ER visits. Because clinical symptoms are very non-specific, imaging plays a major role in differentiating life threatening from less severe diseases and forming a diagnosis. The chest radiograph remains the first imaging despite its limited sensitivity for certain diseases and being prone to inter-observer variability. Comprehensive cardiothoracic CT examinations using most modern CT equipment are well evaluated in their diagnostic accuracy to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and pulmonary embolism. Protocols, literature evidence and appropriate examples will be discussed. In addition the course will highlight nonvascular emergencies such as mediastinal diseases (e.g., esophageal perforation, mediastinitis or pericarditis) and pulmonary emergencies (e.g., pneumonia, edema, pneumothorax, exacerbation of diffuse lung diseases) for which a more comprehensive consideration of imaging findings, lab findings, patient history and clinical information is needed for making the diagnosis.

MSSR42C Interactive Case Discussion**Participants**

Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Presenter*) Advisory Board, Riverain Technologies, LLC

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator

Jorge A. Soto, MD - 2014 Honored Educator

Jorge A. Soto, MD - 2015 Honored Educator

Emergency Radiology Wednesday Poster Discussions

Wednesday, Dec. 2 12:15PM - 12:45PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Mariano Scaglione, MD, Castel Volturno, Italy (*Moderator*) Nothing to Disclose
 Bharti Khurana, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events**ER229-SD-WEA1 The Uniform CT Attenuation Sign of Infectious Cholecystitis: Loss of Normal Gravity-dependent Bile Density Gradient**

Station #1

Participants

Takeshi Wada, MD, Tokyo, Japan (*Presenter*) Nothing to Disclose
 Gensuke Akaike, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Takuya Ueda, MD, Chuo-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose
 Kevin Urayama, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Osamu Takahashi, Chuo-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose
 Jay Starkey, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Midori Enokido, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Ryo Miyazawa, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Naoki Wakabayashi, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Yuji Yaguchi, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Masaki Matsusako, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
 Yasuyuki Kurihara, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Usually the bile in the gallbladder is denser at the bottom than at the top. We noticed the intracholecystic fluid tends to become homogeneous in patients with infection. The purpose of this study is to investigate the usefulness of measuring the difference in CT attenuation of intracholecystic bile to aid in the diagnosis of infectious cholecystitis.

METHOD AND MATERIALS

Institutional review board approval was obtained and informed consent was waived for this retrospective study. We reviewed clinical records of 970 consecutive patients with biliary fluid samples from Jan. 2007 to Sept. 2013. We selected the subset of 370 patients with non-contrast CT and hematologic testing within 24 hours of fluid sampling. We further limited our sample to the 160 patients with direct sampling through percutaneous transhepatic gallbladder drainage (PTGBD) or cholecystectomy, of which total of 99 patients had positive bile cultures and were included in our final analysis (62men and 37 women; mean, 67.5 years; range, 38-96). In addition, we selected 115 patients who underwent CT for annual health checks as controls (90men and 25 women; mean, 69.9 years; range, 40-90). Non-contrast CT was performed with 5-mm slice thickness. Two radiologists assessed the CT images in consensus. CT attenuation of fluid in the gallbladder was measured in the ventral and dorsal portions. The difference of CT attenuation between these areas were compared between patients with positive cultures and controls. Subjects were divided into three groups based on the differences of CT attenuation: Group A, <5HU, Group B, 5-10HU and Group C, >10HU. The odds ratio for positive bile culture was calculated. Student's t, receiver operating characteristic (ROC) and multivariate regression tests were used for statistical analysis.

RESULTS

The difference of intracholecystic CT attenuation was significantly smaller in the patients with positive bile cultures (4.5 ± 3.5 HU) than controls (11.7 ± 5.6 HU) ($P < 0.001$, AUC=0.86). The odds ratio for positive bile cultures was significantly higher in Group A (34.6) and Group B (5.7) compared to Group C.

CONCLUSION

Patients with positive bile cultures tended to have homogeneous intracholecystic CT attenuation.

CLINICAL RELEVANCE/APPLICATION

The uniform CT attenuation sign (loss of normal gravity-dependent bile density gradient) could be a useful indicator of infectious cholecystitis.

ER230-SD-WEA2 Computer Based Simulation - A Novel Tool in the Assessment of Resident Readiness for Call

Station #2

Participants

Linda Lanier, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose
 Erik W. Black, PhD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose
 Chris L. Siström, MD, Gainesville, FL (*Abstract Co-Author*) Research Consultant, National Decision Support Company
 Robbie Slater, MD, Hahira, GA (*Abstract Co-Author*) Nothing to Disclose
 Abeer Ahmed, MD, Gainesville, FL (*Presenter*) Nothing to Disclose
 David P. Miller, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose
 Ilona M. Schmalfuss, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose
 Anthony A. Mancuso, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Assess the feasibility, reliability and validity of computer based simulation in evaluating resident readiness for call duty and other entrustable professional activity (EPA).

METHOD AND MATERIALS

A computer based simulation reflecting a typical emergency imaging shift was designed to assess resident readiness for call. A pilot simulation was administered to R1 (n=12) and R2 (n=10) residents of the home institution. HIPAA compliant, full DICOM image sets of normal and abnormal cases in different modalities covering a spectrum of pathology in emergency radiology were presented on a standard workstation over 8 hours. Residents submitted free text responses of findings. Blinded grading was performed by faculty. Anonymized simulation scores were compared to American College of Radiology In-Training exam (DXIT) scores, faculty evaluations of resident readiness for EPA, and mock oral board results. The second iteration of the simulation was administered in the same manner to R1 (n=47), R2 (n=40), R3 (n=5) and R4 (n=6) residents from 4 institutions. The results were anonymized and analyzed. Item analysis was done on each case used in the simulations. Analysis tools included Pearson correlation, non-parametric correlation, Kappa and exact agreement.

RESULTS

The pilot simulation had acceptable reliability ($\alpha=.752$, 95%CI=.572-881) with a mean of 62.1% (SD=6.8, range=48-72) and 76.7% (SD=3.2, range=72-81) of cases correctly answered by R1 and R2 residents, respectively. The performance difference was significant ($t(20)=6.22$, $p<.01$) and correlated with DXIT scores ($r=.688$, $p<.01$) and faculty evaluations for EPA ($r=.577$, $p=.049$). Item analysis showed differential item function between R1 and R2 residents. Case difficulty ranged from 0 to 1 with an average of 0.72. The second iteration had higher reliability ($\alpha=.847$, 95%CI=.794-893) with higher level residents outperforming junior residents ($F(98)=15.71$, $p<.001$). Item analysis showed similar case difficulty ranging from 0.273 to 0.993 with an average of 0.69.

CONCLUSION

Computer based simulation is a novel, reliable and valid tool in evaluating resident readiness for call duty and other EPA that can be effectively instituted in radiology training programs.

CLINICAL RELEVANCE/APPLICATION

Simulation can objectively assess key competencies required for handling emergency radiology duties, such as interpreting studies without prompts, which can be neglected by multiple choice exams.

ER231-SD-WEA3 Assessing the Clinical Utility of Color Doppler Ultrasound for Ovarian Torsion in the Setting of a Negative Contrast-enhanced CT scan of the Abdomen and Pelvis

Station #3

Participants

Alexander H. Lam, MD, Orange, CA (*Presenter*) Nothing to Disclose
Megha Nayyar, BA, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Roozbeh Houshyar, MD, Sturbridge, MA (*Abstract Co-Author*) Nothing to Disclose
Mohammad Helmy, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Wanda Marfori, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Chandana G. Lall, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to evaluate the utility of color Doppler ultrasound (CDU) in the specific assessment of ovarian torsion following a negative contrast-enhanced computed tomography (CT) examination.

METHOD AND MATERIALS

This is a single-institution, retrospective study of women who presented to the emergency department with abdominal pain between 5/1/2010 to 12/31/2014 who received both a contrast-enhanced CT and CDU within a 24-hour period. The contrast-enhanced, abdominal/pelvic CT examinations were evaluated for CT findings specific to ovarian torsion, including ovarian size greater than 5 cm, presence of free fluid, uterine deviation, fallopian tube thickening, ovarian fat stranding, smooth wall thickening, presence of the "twisted pedicle" sign, and abnormal ovarian enhancement. The results were compared to the presence or absence of ovarian torsion on the concurrent US.

RESULTS

The initial query of cases yielded 834 cases among 789 women, with an average age of 29 years and a range of 14 to 53 years. Of those 834 cases, 283 cases in 261 women received both a CDU and CT within a 24-hour period. The CT examinations demonstrated 48 cases with an increase in ovarian size greater than 5 cm. 84 cases showed the presence of free fluid within the abdomen. 3 cases of fallopian tube thickening were identified. 1 case of smooth wall thickening and a 'twisted pedicle' sign were noted. 15 cases demonstrated stranding of the peri-ovarian fat. 29 cases showed abnormal ovarian enhancement. A total of 111 cases showed at least one positive finding on CT. 14 positive cases were identified on the CDU studies. Of the 14 positive cases, 11 had ovarian size greater than 5 cm. 12 cases demonstrated the presence of free fluid. No uterine deviation or smooth wall thickening. 1 twisted pedicle was noted in the positive cases. 7 cases showed peri-ovarian fat stranding. 10 cases showed abnormal enhancement. Abnormalities were noted in all cases of ovarian torsion seen on CDU. No negative CT examinations were associated with positive CDU. In this set of patients, the negative predictive value of a negative CT examination was 100%.

CONCLUSION

A negative contrast-enhanced CT examination of the abdomen and pelvis appears to be sufficient to rule out ovarian torsion.

CLINICAL RELEVANCE/APPLICATION

There is no utility in the addition of CDU specifically to evaluate for ovarian torsion following a negative contrast enhanced CT scan of the abdomen and pelvis.

Honored Educators

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Chandana G. Lall, MD - 2013 Honored Educator

ER232-SD-WEA4 Monoenergetic Reconstruction in Dual-energy CT Angiography of the Brain: Improved Conspicuity of Acute and Subacute Infarcts

Station #4

Participants

Rita Chiu, MD, Vancouver, BC (*Presenter*) Nothing to Disclose

Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG

Jason R. Shewchuk, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG

PURPOSE

Hypo-attenuating defects identified on CT angiography source images have been shown to predict the likelihood of infarction in the absence of early recanalization. Our study aims to demonstrate improved conspicuity of cerebral infarcts using monoenergetic reconstructions in dual-energy CT angiography in patients with acute stroke.

METHOD AND MATERIALS

62 patients from a single institution underwent dual-energy CT angiography from the aortic arch to skull vertex, 17 patients had a cerebral infarct that was confirmed on follow-up imaging. Quantitative assessment was performed at monoenergetic levels from 40kV to 190kV in 1kV increments by measuring the Hounsfield units in regions of interest drawn at the center of the infarct and in corresponding normal brain parenchyma in the contralateral hemisphere. Similar regions of interest were drawn on the linear blended dual energy reconstructions, which are analogous to conventional 120kVp CT images. Signal-to-noise and contrast-to-noise ratios (SNR, CNR) were calculated at all energy levels for each study. Paired t-test analysis between the maximum CNR obtained from the monoenergetic reconstructions and the CNR of the linear blended reconstructions was performed.

RESULTS

The maximum CNR obtained from the monoenergetic reconstructions at variable energy levels (mean = 1.596) was on average 48% greater than the linear blended reconstruction CNR (mean = 0.773), and was shown to be significantly different following paired t-test analysis ($p < 0.001$).

CONCLUSION

Monochromatic reconstructions demonstrate better CNR than standard linear blended reconstructions on dual-energy CT angiography, improving conspicuity of acute and subacute infarcts in our cohort of patients with acute stroke.

CLINICAL RELEVANCE/APPLICATION

Tailored monoenergetic reconstruction using dual-energy CT angiography maximizes conspicuity of subtle infarcts in patients with acute stroke.

Emergency Radiology Wednesday Poster Discussions

Wednesday, Dec. 2 12:45PM - 1:15PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Mariano Scaglione, MD, Castel Volturno, Italy (*Moderator*) Nothing to Disclose
 Bharti Khurana, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events**ER233-SD-WEB1 MDCT for Suspected Pulmonary Embolism in Patients with Sickle Cell Disease: Assessment of Image Quality**

Station #1

Participants

Jeff D. Jensen, Owings Mills, MD (*Presenter*) Nothing to Disclose
 Elliot K. Fishman, MD, Owings Mills, MD (*Abstract Co-Author*) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc
 Stefan L. Zimmerman, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
 Pamela T. Johnson, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Among the more common indications for MDCT in the emergency department is suspected pulmonary embolism (PE) in patients with sickle cell disease (SCD). The observation that pulmonary artery (PA) enhancement is often suboptimal in these patients prompted this investigation, designed to evaluate PA enhancement quality with state of the art MDCT technology.

METHOD AND MATERIALS

A retrospective search identified SCD patients imaged for suspected pulmonary embolism in 2014 on our emergency department 128-slice dual source MDCT scanner. Exams of 41 SCD subjects were compared to 41 age and weight matched controls for pulmonary artery enhancement quality. The enhancement level of the main pulmonary artery and the descending thoracic aorta were measured retrospectively. Electronic records were reviewed to determine demographics and infusion protocols.

RESULTS

Age (mean 31.3 years for the SCD subjects and 31.5 years for controls, $p=0.92$) and weight (mean 163.9 lbs for SCD subjects and 168.1 lbs for controls, $p=0.67$) were similar. Infusion rates (mean 4.6 for both SCD and controls, $p=0.82$) and contrast volume (mean 96.8 mL for SCD vs 96.6 for controls, $p=0.93$) were also similar. SCD patients had significantly lower main pulmonary artery enhancement (mean 238 HU, range 155-444 HU) than the control subjects (mean 291 HU, range 121-487 HU) (t-test, $p=0.001$). When stratified by HU enhancement range, SCD subjects' main PA enhancement was lower than controls. SCD subjects: <200 HU: 13 (32%) 200-249: 18 (44%) 250-299: 3 (7%) 300-349: 3 (7%) 350-400: 3 (7%) >400: 1 (2%) Control subjects: <200 HU: 3 (7%) 200-249: 9 (22%) 250-299: 10 (24%) 300-349: 9 (22%) 350-400: 6 (15%) >400: 4 (12%)

CONCLUSION

In this series of SCD patients with suspected pulmonary embolism imaged with MDCT, main pulmonary artery enhancement level was lower than nonSCD controls. Quality improvement investigations should identify factors contributing to reduced enhancement levels in these patients, to guide protocol optimization.

CLINICAL RELEVANCE/APPLICATION

Patients with SCD present to the emergency department with chest symptoms that may be due to chest syndrome, infection or pulmonary embolism. IV contrast enhanced MDCT is a critical imaging tool to guide management in this clinical setting. High value practice necessitates protocol optimization to improve MDCT scan quality and facilitate diagnostic confidence when imaging these patients.

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Elliot K. Fishman, MD - 2012 Honored Educator
 Elliot K. Fishman, MD - 2014 Honored Educator
 Stefan L. Zimmerman, MD - 2012 Honored Educator
 Stefan L. Zimmerman, MD - 2015 Honored Educator

ER234-SD-WEB2 The Radiation Dose Saved in Polytrauma CT from Raising Both Arms is Less than the Dose Added by Introducing an Overlapping Segmented Scan Technique

Station #2

Participants

Andrew W. Todd, MBChB, Brighton, United Kingdom (*Presenter*) Nothing to Disclose
 Oliver Duxbury, MBChB, BSc, Brighton, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
 Ahmed Daghir, MRCP, FRCR, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Whole body CT is a key imaging test in polytrauma but it carries a significant radiation burden. A dose saving technique is to raise both arms after scanning the cervical spine before scanning the chest and abdomen. This technique introduces an overlap of the cervico-thoracic junction by necessitating a segmented rather than single-pass scan method. At our institution we audited the change in dose after a switch to the arm-raising technique to determine if there was an overall dose saving or penalty.

METHOD AND MATERIALS

Three cohorts of polytrauma CT patients were retrospectively reviewed; 1) raised arms segmented technique, 2) lowered arms segmented technique, 3) lowered arms single-pass technique. The dose length product (DLP) was recorded for each scan. AP abdominal diameter and length of scanned volume were also measured as potentially significant variables.

RESULTS

The mean DLPs (mGy) were; group 1 (n=28) 1377, group 2 (n=14) 1642, group 3 (n=27) 1103. The DLP for group 2 is significantly higher than group 1 ($p=0.03$), it is also higher than group 3 ($p=0.0003$). Group 1 DLP is higher than group 3 ($p=0.02$). There was no significant difference in abdominal diameter or scanned length.

CONCLUSION

Our results show that raising the patient's arms reduces the dose, and this is concordant with published data. However changing to a segmental scan, with overlap at the cervico-thoracic junction, results in an increase in dose. Overall our data implies the dose saved by raising both arms is outweighed by the dose penalty added by introducing an overlapping segmented scan technique.

CLINICAL RELEVANCE/APPLICATION

Our data shows an overlapping segmented CT for polytrauma leads to significant increase in radiation dose compared to a single-pass method, and this outweighs the dose reduction from raising the arms.

Essentials of Pediatric Imaging

Wednesday, Dec. 2 1:30PM - 3:00PM Location: S100AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

MSES43A Traumatic Hemorrhage within the Extra-axial Spaces: Accidental or Inflicted?

Participants

Gary L. Hedlund, DO, Salt Lake City, UT, (gary.hedlund@imail.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Contrast the differences between pediatric and adult epidural intracranial hemorrhages. 2) Develop an expanded understanding of traumatic pediatric subdural hemorrhage. 3) Identify the clinical significance and imaging characteristics of subdural hygroma. 4) Describe the CT and MRI features of subdural hemorrhage arising from abusive and accidental trauma. 5) Identify pediatric subarachnoid hemorrhage, recognize its significance, and differentiate it from pseudo-subarachnoid hemorrhage.

ABSTRACT

The presence of post-traumatic hemorrhage within the pediatric intracranial extra-axial compartments should be viewed as a proxy for underlying brain injury. This live RSNA activity will review the coverings of the brain and the compartments that may be involved in accumulating post-traumatic hemorrhage. The session will address hemorrhage within the epidural space, subdural compartment, and subarachnoid space. The focus will be upon hemorrhages within the subdural compartment, their clinical significance in the pediatric population, origin, imaging characteristics, and the features of subdural hemorrhage more commonly observed with accidental and inflicted head trauma. The complimentary nature of non-enhanced CT (NECT) and MRI in characterizing and estimating age of the pediatric subdural hemorrhage will be emphasized. The value of serial imaging will be discussed.

MSES43B Imaging of Congenital Chest Abnormalities

Participants

Stephanie P. Ryan, MD, Dublin, Ireland (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Interpret chest radiographs in newborns with congenital pulmonary abnormality. 2) Plan further imaging assessment in the newborn with congenital pulmonary abnormality. 3) Recognise imaging findings and plan further imaging investigation in an older child with congenital pulmonary abnormality.

ABSTRACT

This session will address the radiographic findings and further imaging in congenital chest abnormalities including cystic adenomatoid malformation, congenital lobar emphysema and different forms of sequestration. The imaging findings of tracheo-esophageal fistula, of chylothorax and of different types of diaphragmatic hernia will also be addressed. There will be an emphasis on the imaging findings that affect management and some controversies around imaging and management will be reviewed.

MSES43C Ventral Wall Abnormalities in the Neonate

Participants

Henry J. Baskin JR, MD, Salt Lake Cty, UT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the most common ventral wall abnormalities in neonates, including omphalocele, gastroschisis, bladder exstrophy, and prune-belly syndrome. 2) Compare and contrast the clinical characteristics of these defects. 3) Identify the imaging features of each of these ventral wall abnormalities. 4) Understand the treatment of these defects, and be familiar with their imaging implications in older children.

ABSTRACT

Neonatal ventral wall abnormalities encompass a broad group of rare congenital defects such as omphalocele, gastroschisis, bladder exstrophy, and prune-belly syndrome. Although these congenital abnormalities are varied in terms of pathophysiology, clinical findings, and treatment, their similarities allow them to be easily confused by radiologists. This is especially problematic as children with ventral wall abnormalities have very high rates of associated gastrointestinal, musculoskeletal, urogenital, and cardiovascular problems, and so often require fairly extensive medical imaging expertise. This activity will compare and contrast the clinical characteristics of ventral wall abnormalities, illustrate the important imaging features of each, and familiarize the attendee with how these abnormalities are treated.

RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)

Wednesday, Dec. 2 1:30PM - 3:00PM Location: S402AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Moderator*) Nothing to Disclose
Andras Palko, MD, PhD, Szeged, Hungary (*Moderator*) Medical Advisory Board, Affidea Group;

Sub-Events**MSSR43A Abdominal Injuries****Participants**

Andras Palko, MD, PhD, Szeged, Hungary, (palko.andras@med.u-szeged.hu) (*Presenter*) Medical Advisory Board, Affidea Group;

LEARNING OBJECTIVES

1) To explain the significance of injury mechanism and its role in the formation of consequent abdominal lesions and their complications. 2) To outline the role of proper imaging technique and diagnostic algorithm in the sufficiently fast diagnosis of abdominal injuries. 3) To learn more about the typical and unusual findings of various abdominal traumatic conditions.

ABSTRACT

Abdominal injuries require a timely and reliable diagnosis in order to prevent the potentially lethal outcome. The armory of clinical tools (physical examination, lab tests) does not fulfill these criteria, since they are either not fast, or not reliable. Imaging diagnostic modalities help the clinician to acquire the necessary amount of information to initiate focused and effective treatment. However, the selection of the appropriate imaging algorithm, modality and technique, as well as the precise detection and interpretation of essential imaging findings are frequently challenging, especially because the circumstances, under which these examinations are performed (open wounds, bandages, non-removable life-supporting equipment, lack of patient cooperation, etc.), are frequently less than optimal. Knowledge of critical imaging signs, symptoms and the role they play in the evaluation of the patient's condition, but also fast decision-making and ability to closely cooperate with the clinicians are skills of key importance for radiologist members of the trauma team.

MSSR43B The Enemy Within, Non-Traumatic Abdominal Emergencies**Participants**

Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia. 3) Attendees will learn the CT findings of common causes of an "acute" abdomen. 4) Attendees will learn the imaging findings of acute, nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

This segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain. CT findings will be emphasized. Key imaging findings of nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

MSSR43C Interactive Case Discussion**Participants**

Andras Palko, MD, PhD, Szeged, Hungary (*Presenter*) Medical Advisory Board, Affidea Group;
Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for traumatic and non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia and injuries. 3) Attendees will learn the CT findings of common causes of a traumatic and non-traumatic 'acute' abdomen. 4) Attendees will learn the imaging findings of acute, traumatic and nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

Using cases and an audience response system, this segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain and abdominal injuries. CT findings will be emphasized. Key imaging findings of traumatic and nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of blunt and penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

SSM07

Emergency Radiology (Neurologic Emergencies)

Wednesday, Dec. 2 3:00PM - 4:00PM Location: S403B



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Clint W. Sliker, MD, Ellicott City, MD (*Moderator*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Moderator*) Institutional research agreement, Siemens AG

Sub-Events

SSM07-01 Utility of Repeat Head CT in Mild Traumatic Brain Injury (mTBI) Patients Presenting with Small Isolated Falcine or Tentorial Subdural Hematoma (SDH)

Wednesday, Dec. 2 3:00PM - 3:10PM Location: S403B

Participants

Kavi K. Devulapalli, MD, MPH, San Francisco, CA (*Presenter*) Nothing to Disclose
Alisa D. Gean, MD, San Francisco, CA (*Abstract Co-Author*) Medical Advisory Board, Samsung Electronics Co Ltd Speakers Bureau, Educational Symposium International Stockholder, Global Indemnity plc Spouse, Employee, Global Indemnity plc
Jared A. Narvid, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Esther L. Yuh, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Bhavya Rehani, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Michael C. Huang, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
David McCoy, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Alina Uzelac, MD, Mill Valley, CA (*Abstract Co-Author*) Nothing to Disclose
Jason F. Talbott, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Data Safety Monitoring Board, StemCells, Inc

PURPOSE

In cases of mTBI with acute intracranial hemorrhage, serial head CT (hCT) scans to evaluate stability are routinely performed, even in cases of isolated small hemorrhages which are not easily accessible for surgical decompression. This practice has not been validated, and repeat exams frequently necessitate increased emergency room stay times, ICU monitoring, and additional exposure to ionizing radiation. The goal of this study is to evaluate clinical and imaging features of isolated falcine and tentorial SDH at presentation and short term follow-up.

METHOD AND MATERIALS

A retrospective analysis of all patients presenting to our Level 1 trauma center from January 2013 through March 2015 undergoing initial and short-term follow-up hCT with initial findings positive for isolated SDH along the falx and/or tentorium was performed. Patients with penetrating trauma, other sites of intracranial hemorrhage, brain contusion, or depressed skull fractures were excluded. Clinical information including gender, age and history of anticoagulation was obtained through review of electronic medical records.

RESULTS

90 patients met inclusion criteria (55 males; 35 females; average age 57.8 years). 63% of SDHs were falcine, 32% tentorial and 5% mixed. On average, isolated falcotentorial SDHs were small (mean thickness = 2.7mm; range 2-8mm), without significant mass effect, and decreased in size on follow-up hCT with an average follow-up time of 8.4 hours. Increase in SDH size was seen in 3 patients (3%) with average increase in SDH thickness of 3.3-mm. No new intracranial hemorrhages were seen on follow-up hCT. 2 of 3 patients with increase in SDH were anti-coagulated (average INR = 3.8) and the remaining patient had a depressed platelet count. In total, nine patients (10%) were anti-coagulated at presentation with mean INR=3.2 (range 2.1-4.9).

CONCLUSION

Isolated falcine and tentorial SDHs in mild TBI are small and rarely increase in size on short term followup hCT. Present data suggest repeat hCT in mTBI patients with isolated falcine or tentorial SDH who are not anti-coagulated is unnecessary for assessing stability of hemorrhage. In anti-coagulated patients and patients with low platelet counts, follow-up imaging is advisable.

CLINICAL RELEVANCE/APPLICATION

Isolated parafalcine and paratentorial SDH are common findings after trauma and often necessitate repeat imaging. This project may help guide clinical decision making with regards to repeat imaging.

SSM07-02 Traumatic Midline Subarachnoid Hemorrhages on Initial Computed Tomography as Markers of Severe Diffuse Axonal Injury

Wednesday, Dec. 2 3:10PM - 3:20PM Location: S403B

Awards

Trainee Research Prize - Fellow

Participants

Daddy Mata Mbemba, MD, PhD, Sendai, Japan (*Presenter*) Nothing to Disclose
Shunji Mugikura, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsuhiko Nakagawa, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Takaki Murata, MD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuko Tatewaki, MD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose

Yumiko Kato, MD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Li Li, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Teiji Tominaga, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Shoki Takahashi, MD, Aoba, Japan (*Abstract Co-Author*) Nothing to Disclose
Kei Takase, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The presence of intraventricular hemorrhage (IVH) on initial CT (iCT) has been recently reported to predict diffuse axonal injury (DAI) located in the corpus callosum or brain stem (severe DAI) on subsequent MRI. We aimed to test the hypothesis that midline (interhemispheric and perimesencephalic) subarachnoid hemorrhages (SAH) commonly associated with IVH on iCT could have a similar clinical value in predicting severe DAI.

METHOD AND MATERIALS

Consecutive 270 head trauma patients who underwent iCT within 24 hours and MRI within 30 days were included. First, as potential CT predictors of DAI, we used the following 6 CT items included in Marshall or Rotterdam CT scores: status of basal cistern, status of midline shift, epidural hematoma, IVH, SAH, and volume of hemorrhagic mass. Next, SAH were searched at cerebral cortices, sylvian fissures, sylvian vallicula, cerebellar folia, interhemispheric fissure, and perimesencephalic cisterns and a 7-grade (0 to 6, 0 means no SAH) SAH severity score based on these locations was assigned to each patient. Based on MRI results, patients were divided in two groups of DAI positive and DAI negative, and were assigned a following DAI staging reported to be prognostic of functional outcome, stage 3 being the worst: stage 0: no DAI, 1: DAI in the lobar white matter or cerebellum, 2: DAI in the corpus callosum with or without stage 1 lesions, and 3: DAI in the brain stem with or without stages 1 or 2 lesions.

RESULTS

77 (28.5%) of 270 patients had DAI. Of the 6 CT items, IVH and SAH were independently associated with DAI (both $P < 0.05$). Of the locations, the interhemispheric and perimesencephalic SAH were the independent predictors of DAI (both $P < 0.05$). SAH score and DAI staging showed significant positive correlation ($P < 0.0001$). SAH score in DAI stage 3 or stage 2 was significantly higher than that of DAI stage 0 (both, $P < 0.0001$). No statistical significant difference was noted in SAH score between DAI stages 0 and 1. The presence of midline SAH on iCT had sensitivity of 60.7%, specificity of 81.8%, PPV of 43.6% and NPV of 90% in predicting severe DAI.

CONCLUSION

Midline SAH on iCT are makers of DAI, specifically severe DAI. Using them as markers could greatly reduce unnecessary MRI in head trauma patients

CLINICAL RELEVANCE/APPLICATION

Knowing that midline SAH on iCT has the same value as IVH in predicting severe DAI assists clinician to properly select head trauma patients who should undergo subsequent MRI.

SSM07-03 Delayed Intracranial Hemorrhage (ICH) in Patients Receiving Anti-coagulant or Prescription Anti-platelet (ACAP) Medication after Mild Blunt Trauma: Is Repeat hCT Necessary?

Wednesday, Dec. 2 3:20PM - 3:30PM Location: S403B

Participants

Kavi K. Devulapalli, MD, MPH, San Francisco, CA (*Presenter*) Nothing to Disclose
Alina Uzelac, MD, Mill Valley, CA (*Abstract Co-Author*) Nothing to Disclose
Esther L. Yuh, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
David McCoy, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Alisa D. Gean, MD, San Francisco, CA (*Abstract Co-Author*) Medical Advisory Board, Samsung Electronics Co Ltd Speakers Bureau, Educational Symposium International Stockholder, Global Indemnity plc Spouse, Employee, Global Indemnity plc
Michael C. Huang, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Jason F. Talbott, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Data Safety Monitoring Board, StemCells, Inc

PURPOSE

Current literature is conflicted with respect to the risk of delayed intracranial hemorrhage (ICH) in patients undergoing ACAP medication after blunt head trauma. Short interval follow-up hCT after an initially negative hCT is routine practice at many institutions. Given the rise in patients on ACAP therapy, we sought to formally evaluate our institution's 6-hour repeat hCT protocol in this population who present with an initially negative hCT after blunt trauma.

METHOD AND MATERIALS

A retrospective query of our radiologic database was performed to identify all consecutive non-contrast hCT studies performed between January 2013 and November 2014 using search terms for generic and commercial names of ten common anticoagulation and prescription anti-platelet medications in addition to the general terms "anticoagulant", "anticoagulation" and "blood thinner." Studies were further screened on the basis of a prior CT within 24 hours, which was performed because of trauma and negative for intracranial traumatic pathology. Patients with indications for follow-up imaging other than ACAP use were excluded.

RESULTS

A total of 216 patients met inclusion criteria with only 2/216 (0.9%) developing delayed ICH. Both patients with delayed ICH were found to have trace volume subarachnoid hemorrhage in the ambient cistern, however without associated neurologic deficit or new symptoms. Both of these patients were receiving Coumadin anticoagulation with average INR of 2.5 at the time of admission and were subsequently treated to reverse their anticoagulation and discharged after short ICU observation without adverse event.

CONCLUSION

In our study, the incidence of delayed intracranial hemorrhage in patients receiving ACAP therapy was very small (<1%). The rare cases with delayed ICH were clinically silent. Present data build upon previous literature and lend further evidence that a short-interval follow-up CT among patients receiving ACAP therapy with an initially negative hCT after trauma may be unnecessary.

CLINICAL RELEVANCE/APPLICATION

Head CT is commonly performed after blunt trauma. Results from this study may help to guide clinical decision making regarding imaging in a subset of patients taking anti-coagulant or prescription anti-platelet medication.

SSM07-04 High-pitch Paranasal Sinus CT in Drunken Emergency Room Patients after Assault - Initial Results on Image Quality and Dose with Third-generation Dual-source CT

Wednesday, Dec. 2 3:30PM - 3:40PM Location: S403B

Participants

Claudia Frellesen, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Patricia Dewes, MD, Frankfurt, Germany (*Presenter*) Nothing to Disclose
Boris Schulz, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Jan-Erik Scholtz, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Josef Matthias Kerl, MD, Frankfurt, Germany (*Abstract Co-Author*) Research Consultant, Siemens AG Speakers Bureau, Siemens AG
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Ralf W. Bauer, MD, Frankfurt, Germany (*Abstract Co-Author*) Research Consultant, Siemens AG Speakers Bureau, Siemens AG

PURPOSE

Image quality benefits from high-pitch scanning in agitated patients by freezing patient motion. We compared image quality and exposure parameters in patients with suspected maxillofacial fractures on second- and third-generation dual-source CT (DSCT)

METHOD AND MATERIALS

4 groups with 30 patients each were compared according to CTDIvol, DLP, acquisition time and subjective image quality. The first group was examined on a second-generation DSCT (Flash, Siemens) with fixed 120 kV/50 mAs, pitch 3.0. The other three groups were examined on a third-generation DSCT (Force, Siemens): group 1 with fixed 120 kV/50 mAs and pitch 2.2; group 3 and 4 with fixed 120kV and automated exposure control (AEC) with 50 ref.mAs and pitch factors of 2.2 and 3.0, respectively. Images in groups 2-4 were reconstructed with iterative reconstruction (ADMIRE), in group 1 with FBP

RESULTS

Median CTDIvol (2.76 vs. 2.66 vs. 0.66 vs. 0.69 mGy) and DLP (58 vs. 41 vs. 13 vs. 14 mGycm) were significantly lower in group 3 and 4 scanned on the third-generation DSCT with AEC (-76%/-75% and -75%/74%; $p < 0.0001$) without significant difference among each other. Subjective image quality was rated best in group 2 followed by group 3, both with a pitch factor of 2.2 (average scores: 1.87/1.70 vs. 1.40/1.30 vs. 1.63/1.50 vs. 2.43/2.27). Due to strong high-pitch artefacts the subjective image quality of group 4 was inferior to all other groups. Median acquisition time was significantly faster using third-generation DSCT (450 ms vs. 300 ms vs. 380 ms vs. 270 ms; $p < 0.05$).

CONCLUSION

Third-generation DSCT yields faster acquisition times and substantial radiation dose reduction using AEC. A pitch of 2.2 should be preferred since high-pitch artefacts are reduced. Although AEC was used, subjective image quality remains stable and reliable with iterative reconstruction

CLINICAL RELEVANCE/APPLICATION

Faster CT examination of agitated patients with suspected maxillofacial trauma with reduced radiation exposure and reliable image quality.

SSM07-06 Dual Energy in Noncontrast Head CT: Differentiation of Calcification from Acute Hemorrhage

Wednesday, Dec. 2 3:50PM - 4:00PM Location: S403B

Participants

Christopher A. Potter, MD, Boston, MA (*Presenter*) Nothing to Disclose
Andrew Primak, PhD, Malvern, PA (*Abstract Co-Author*) Employee, Siemens AG
Aaron D. Sodickson, MD, PhD, Wayland, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group

PURPOSE

To evaluate whether a novel DECT postprocessing application that separates calcification from hemorrhage can reliably differentiate these materials in non-contrast head CT foci in an indeterminate Hounsfield Unit (HU) range.

METHOD AND MATERIALS

DECT acquisitions of noncontrast head CTs were performed in the Emergency Department on a 128x2 slice dual-energy scanner (Siemens FLASH, Forchheim Germany). All scans containing foci of intracranial calcification or hemorrhage of 50-85 HU were included. Foci were designated as calcium or hemorrhage based on typical morphology or confirmatory imaging. DECT acquisitions used tube voltages 100/Sn140 kVp and tube current modulation (CareDose4D) using reference mAs 300/300. Source images from each tube were reconstructed as 0.75 x 0.5 mm slices and used for postprocessing on thin-client server (Syngo via, version VA30). The Brain Hemorrhage 3-material decomposition application designed to differentiate iodine from hemorrhage was modified by changing the iodine dual energy ratio to the calcium ratio of 1.44. Dual energy regions of interest (ROI) were placed to measure HU and standard deviation (std) in the mixed high/low kVp image, and the corresponding virtual non-calcium (VNCa) and calcium-map (Ca) images. CTDIvol and DLP values were recorded.

RESULTS

10 foci each of calcification and hemorrhage were analyzed. Foci could not be differentiated based on mixed-image HUs (unpaired t-test $p=0.24$), with mean \pm std (range) of 63 \pm 7 (55-73) HU for hemorrhage and 68 \pm 12 (52-84) for calcification. VNCa and Ca images demonstrated excellent separation of hemorrhagic from calcified foci (both $p < 0.0001$). Calculated HU due to calcium content was 4 \pm 10 (-7-26) HU in hemorrhages and 48 \pm 15 (28-72) in calcific foci. VNCa content was 58 \pm 12 (44-80) HU in hemorrhages and 20 \pm 7 (10-28) in calcific foci. A VNCa threshold value of greater than 35 HU correctly attributed all hemorrhage and calcium cases. X-ray tube output mean \pm std (range) values were CTDIvol 48 \pm 4 (40-54) mGy and DLP 842

+/- 112 (618-1015).

CONCLUSION

DECT can reliably differentiate intracranial calcification from hemorrhage in a proof-of-principle cohort of indeterminate HU value foci where densities typically overlap.

CLINICAL RELEVANCE/APPLICATION

DECT shows promise in differentiating foci of hemorrhage from calcification in ranges where HU values overlap, which may be beneficial when HU values alone are not definitive.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Neuroradiology (Cerebral Ischemia and Hemorrhage)

Wednesday, Dec. 2 3:00PM - 4:00PM Location: N229



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Ronald L. Wolf, MD, PhD, Philadelphia, PA (*Moderator*) Nothing to Disclose
Jalal B. Andre, MD, Seattle, WA (*Moderator*) Research Grant, Koninklijke Philips NV; Consultant, Hobbitview, Inc; Research Grant, Toshiba Corporation;

Sub-Events

SSM19-01 Comparison of Iodinated Contrast Staining and Hyperacute Hemorrhage on MRI : Phantom Study

Wednesday, Dec. 2 3:00PM - 3:10PM Location: N229

Participants

Sung-Hye You, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Kyu Ri Son, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Byung-Joon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nam Joon Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mina Song, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the effect of diluted iodinated contrast agents with normal saline or blood on the magnetic resonance (MR) imaging, especially on T1 weighted image(T1WI), T2 weighted image (T2WI) and gradient echo image(GRE) for distinguishing contrast staining from hyperacute hemorrhage which could occur after intraarterial thrombolysis in the patient with acute stroke.

METHOD AND MATERIALS

On a 3.0T MRI, T1WI, T2WI and GRE images were scanned using the phantom with diluted five different kinds of non-ionic iodinated contrast agents with different concentration (0, 0.1, 0.4, 0.6, 1.2, 2, 2.4 M I mole/L). The contrast agents are diluted with normal saline or venous blood (which was sampled within 6 hours). We compared SI of the phantom visually, and quantitatively calculated T1- and T2-relaxation times.

RESULTS

Iodinated contrast agents showed T1 and T2 shortening effect. With increase in concentration of contrast agents, the effect of T1 and T2 shortening became more prominent. T2 shortening effect of the iodinated contrast agents was much weaker than that of the product of venous blood. Whereas diluted iodinated contrast agents with normal saline showed intermediate SI on GRE image, blood with/without iodinated contrast agents showed dark SI on GRE image. FIG Comparison of SI among the physiologic saline, undiluted iodinated contrast agent, diluted iodinated contrast agent with saline, contrast agent diluted with blood and undiluted blood itself on T2WI, T1WI and GRE image. Contrast agent mixed with blood or blood itself could be distinguished from diluted iodinated contrast agents at T2WI and GRE image.

CONCLUSION

By obtaining T2WI and GRE images, clinicians may be able to discriminate iodinated contrast staining from hyperacute hemorrhage in stroke patients receiving transarterial thrombolysis.

CLINICAL RELEVANCE/APPLICATION

By obtaining T2WI and GRE images, clinicians may be able to discriminate iodinated contrast staining from hyperacute hemorrhage in acute stroke patients after intrasarterial thrombolysis.

SSM19-02 Digital Subtraction Angiogram for Perimesencephalic Subarachnoid Hemorrhage: Is Once Enough? A Retrospective Study, Systematic Review and Meta-analysis

Wednesday, Dec. 2 3:10PM - 3:20PM Location: N229

Participants

Christopher A. Potter, MD, Boston, MA (*Presenter*) Nothing to Disclose
Kathleen R. Fink, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Amanda L. Ginn, BA, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
David R. Haynor, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Non-aneurysmal subarachnoid hemorrhage (NASAH) accounts for 15% of subarachnoid hemorrhage (SAH) cases. A subset of NASAH patients with perimesencephalic hemorrhage distribution (PM-NASAH) has a relatively benign clinical course. Identifying these patients on initial imaging can prevent exposure to the risks of multiple conventional angiograms. Previous studies demonstrating adequacy of a single initial digital subtraction angiogram (DSA) have been suggestive, but underpowered.

METHOD AND MATERIALS

Our institutional retrospective study included consecutive patients from 01/2000-12/2013 with noncontrast head CT within 48 hours positive for SAH, negative initial DSA and followup DSA within 10 days. 252 subjects were identified. Head CT images were reviewed and strictly classified per criteria of van Gijn. 131 subjects with PM-NASAH were identified. DSA reports and images were

reviewed. The medical record was reviewed, including condition at last follow up. Systematic review and meta-analysis using MEDLINE and electronic databases from database inception through 11/01/2014 identified studies documenting workup of patients with NASAH. Inclusion criteria were (a) consecutive patients, (b) head CT within 72h, (c) categorization of PM-NASA as per Gijn et al, (d) initial negative DSA, (e) follow up DSA within 10 days. Exclusion criteria included cohort of less than 25 subjects. Data from 6 included studies were pooled. Methodology was assessed using the MOOSE guidelines for observational meta-analyses.

RESULTS

131 subjects from our institutional study were pooled with 298 subjects from 6 included studies. No aneurysm was seen on follow up DSA at our institution. 3 aneurysms were reported in the included studies. 2 of the 3 were reported in studies with cases that preceded current DSA technique. Diagnostic yield of subsequent DSA following initial negative DSA was 0.7% (95% CI, 0-1.4%), similar or less than the rate of DSA complication, reported from 0.3% to 2.6%.

CONCLUSION

In patients with SAH that strictly adheres to the PM-NASA pattern, a single DSA essentially excludes a causative aneurysm. Subsequent DSA examinations are very unlikely to benefit and expose patients to unnecessary risk.

CLINICAL RELEVANCE/APPLICATION

Complications from SAH and hemorrhage recurrence in patients with PM-NASA are rare. Reducing additive risk of multiple DSA examinations is essential in the preventing complications in a benign disease course.

SSM19-03 Dynamics of Cerebral Perfusion Deficits after Subarachnoid Hemorrhage - Predictive Value of an Early Incidence

Wednesday, Dec. 2 3:20PM - 3:30PM Location: N229

Participants

Christian Rubbert, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
Rebecca May, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Bernd Turowski, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Delayed cerebral ischemia (DCI) is the major contributor to reduced functional outcome after subarachnoid hemorrhage (SAH). Although the pathogenesis of DCI is not fully understood, limitations in microcirculation appear to be one of the main drivers. CT perfusion (CTP) imaging can indirectly measure microcirculation and is increasingly used in treatment decisions. Early changes in perfusion might be able to predict the risk for critical changes in perfusion after SAH and allow for further risk stratification. To this end, the value of early CTP imaging is retrospectively analyzed.

METHOD AND MATERIALS

Between 1/2006 and 6/2010 351 patients with an aneurysmal SAH underwent CTP imaging. According to local guidelines, CTP imaging is acquired within 1 day after aneurysm treatment (range 0-2d after SAH), 6-8d and 9-11d after SAH or when there is clinical suspicion for deterioration in brain perfusion. Inclusion criteria were 1) at least one early CTP exam <72h after SAH and 2) at least 3 CTP exams in total. 813 CTP exams of 166 patients (4.9±1.8 exams/patient, aged 53.2±12.4, 65.1% female) were analyzed. Purpose-built software was used to automatically generate perfusion parameter maps, define a 1 cm wide circular ROI along the cortex and compute a running average over 10° every 2° for each parameter. The mean transit time (MTT) was evaluated. Critical changes in perfusion were defined as a mean MTT ≥4.1s in a hemisphere according to prior work. Receiver-Operator-Characteristic analysis was performed to identify the MTT cutoff with the highest sensitivity and specificity in early CTP imaging to predict critical changes in perfusion in follow-up CTP imaging.

RESULTS

The optimal MTT cutoff was 3.58s (AUC 0.65). 88 of 166 patients (53%) had an early MTT ≥3.58s. Critical changes in follow-up CTP imaging were observed in 67 of 166 patients (40.4%) and could be predicted with a sensitivity of 67.2% and specificity of 56.6%.

CONCLUSION

Critical changes in brain perfusion in follow-up CTP imaging can, to some degree, be predicted by early CTP imaging <72h after SAH. Further research is needed to improve the prediction model and include data on functional outcome. Given the potential disabilities due to DCI, a cutoff with a higher sensitivity and lower specificity may be of greater clinical value.

CLINICAL RELEVANCE/APPLICATION

Early CTP imaging might be used in the decision to escalate neuromonitoring.

SSM19-04 Diagnostic Yield of Cervical Spine MRI in the Setting of Angiogram-Negative Spontaneous Intracranial Subarachnoid Hemorrhage

Wednesday, Dec. 2 3:30PM - 3:40PM Location: N229

Participants

Gelareh Sadigh, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Chad A. Holder, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Jason W. Allen, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the diagnostic yield of cervical spine (c-spine) magnetic resonance imaging (MRI) in identifying a structural cause for angiogram-negative spontaneous subarachnoid hemorrhage (SAH).

METHOD AND MATERIALS

Consecutive patients 18 years or older presenting with acute spontaneous (non-traumatic) intracranial SAH between February 2009

and October 2014 at two University Hospitals whose catheter angiography results did not reveal an etiology for the SAH, and who underwent c-spine MRI as part of the angiogram-negative SAH protocol, were eligible. Patients with acute intracerebral, subdural or epidural hematoma, parenchymal contusion, recent history of trauma, or previously known cervical vascular malformation were excluded. All patients underwent noncontrast head CT, CT angiography of the head and neck, and MRI of the brain and c-spine as part of the angiogram-negative SAH protocol. Radiology reports from c-spine MRI scans, interpreted by board-certified (CAQ) neuroradiologists, were retrospectively reviewed, with IRB approval.

RESULTS

232 patients met inclusion criteria (mean age 54 years; 50% male; 53% white; 26% African-American). 77% of patients presented to the hospital within 24 hours of experiencing symptoms. SAH was diagnosed by head CT in 97% of cases and by lumbar puncture in 3%. Of 135 patients with reported Hunt and Hess classification of SAH in the electronic medical record, 70% were scored 1, 4% scored 2, 18% scored 3, 7% scored 4, and 1% scored 5. Catheter angiography was performed within the first 4 days after admission in all cases (median of 12 hours). C-spine MRI was performed within the first 19 days after admission in all cases (median of 24 hours). In all 232 patients (100%), c-spine MRI was negative for an etiology to explain the SAH.

CONCLUSION

In our large retrospective series, c-spine MRI following angiogram-negative spontaneous SAH, specifically following a negative head and neck CTA, had no diagnostic yield and is not routinely needed.

CLINICAL RELEVANCE/APPLICATION

C-spine MRI following angiogram-negative SAH has very low to no diagnostic yield. Our data indicate that routine MRI for cervical sources of intracranial SAH after a negative angiogram is not warranted.

SSM19-05 Blood Brain Barrier Permeability Imaging Correlates with Cerebrospinal Fluid Matrix Metalloproteinase-2 (MMP-2) Levels in Aneurysmal Subarachnoid Hemorrhage

Wednesday, Dec. 2 3:40PM - 3:50PM Location: N229

Participants

Jana Ivanidze, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose
Omar N. Kallas, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ashley E. Giambone, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Michael Lerario, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Alan Z. Segal, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ajay Gupta, MD, New York, NY (*Abstract Co-Author*) Research Consultant, Biomedical Systems; Research support, General Electric Company
Moonsoo Jin, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Pina C. Sanelli, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT Perfusion (CTP) allows assessment of quantitative blood brain barrier permeability (BBBP) parameters, including PS (flow across the vessel wall to the extravascular extracellular space (EES)), Ktrans (plasma flow per unit tissue volume), and VE (EES volume). However, sensitivity has to date not been established in the clinical setting. Matrix metalloproteinase 2 (MMP-2) is a known molecular upregulator of BBBP. The purpose of our study was to correlate quantitative BBBP parameters on CTP with MMP-2 cerebrospinal fluid (CSF) protein levels in aneurysmal subarachnoid hemorrhage (SAH) patients to assess the ability of CTP to detect BBB dysfunction in the clinical setting.

METHOD AND MATERIALS

In this prospective IRB-approved study, 10 SAH patients underwent extended whole brain CTP with an axial shuttle mode protocol on day 0-3 after aneurysmal rupture. CTP data were post-processed into quantitative PS, Ktrans and VE maps using Olea Sphere software (Olea Medical, La Ciotat, France). Global mean values were calculated from standardized cortically based ROIs. CSF was collected via ventriculostomy catheter (placed for intracranial pressure management) within 24 hours of CTP. MMP-2 protein levels were measured in CSF supernatant using multiplex microbead immunoassay technology (Luminex Corp, Austin, TX). Spearman correlation analysis was performed to determine correlation between MMP-2 levels with each BBBP parameter.

RESULTS

Median patient age was 55 years, and the median modified Fisher score was 4. 80% of patients had hydrocephalus and 70% had global cerebral edema at presentation. There was a statistically significant positive correlation between MMP-2 CSF levels and PS ($r = 0.6565$; $p = 0.0448$), Ktrans ($r = 0.8024$; $p = 0.0075$), and VE ($r = 0.7477$; $p = 0.0164$), respectively.

CONCLUSION

Elevation of PS, Ktrans and VE indicates increased flow across the BBB into the EES, or increased BBBP. MMP-2 is an established indicator of BBBP. We demonstrate that elevated BBBP, as evaluated by CTP, correlates with elevated CSF levels of MMP-2 in patients with SAH, further establishing CTP as a promising tool to assess BBB dysfunction in the clinical setting.

CLINICAL RELEVANCE/APPLICATION

This preliminary study supports the clinical application of quantitative BBBP imaging with CTP. In SAH, where elevated BBBP has been shown to correlate with poor clinical outcomes, this application may become an important prognostic indicator in future studies.

SSM19-06 Preliminary Evaluation of Arterial Spin Labeling as a Method to Predict Clinically Significant Vasospasm Following Aneurysmal Subarachnoid Hemorrhage

Wednesday, Dec. 2 3:50PM - 4:00PM Location: N229

Participants

Jalal B. Andre, MD, Seattle, WA (*Presenter*) Research Grant, Koninklijke Philips NV; Consultant, Hobbitview, Inc; Research Grant, Toshiba Corporation;

Michael Levitt, MD, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV
Danial K. Hallam, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Greg Zaharchuk, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research Grant, General Electric Company;
Daniel S. Hippe, MS, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Basavaraj Ghodke, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Laligam Sekhar, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Danny J. Wang, PhD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, Siemens AG Research Grant, Biogen Idec Inc Shareholder, Translational MRI, LLC
Max Wintermark, MD, Lausanne, Switzerland (*Abstract Co-Author*) Advisory Board, General Electric Company;
Louis Kim, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Yoshimi Anzai, MD, Salt Lake Cty, UT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate a multidelay, pseudocontinuous arterial spin labeling (MDpCASL)-based screening tool for the diagnosis of vasospasm (VSP) in patients with aneurysmal subarachnoid hemorrhage (aSAH).

METHOD AND MATERIALS

Patients with clinically suspected VSP after aSAH (based on clinical and/or Transcranial Doppler exam) underwent a 10-minute MDpCASL MRI en route to digital subtraction angiography (DSA) for endovascular VSP intervention. The multi-parametric MDpCASL sequence was performed with background suppression and 3-dimensional gradient- and spin-echo readout, at 4 postlabel delays ($=1.5/2/2.5/3s$), and processed using an in-house post-processing pipeline to generate quantitative CBF maps. DSA images were independently reviewed by two blinded, expert neurointerventional readers at a PACS station for the presence, location and extent of VSP, and asked to provide treatment recommendations. Readers were then shown corresponding ASL images and asked how this information influenced treatment recommendations. ASL images were evaluated by a third, blinded expert reader with extensive ASL experience. DSA and ASL findings were aggregated into 5 major vascular territories per patient (anterior left and right, middle left and right and posterior) for comparison. Associations between DSA and ASL were analyzed using logistic regression based on generalized estimating equations to account for repeated measurements per patient.

RESULTS

Ten patients were studied. ASL perfusion deficits were significantly associated with spasm on DSA ($p=0.002$). ASL detected clinically significant perfusion deficits in nearly 31% of evaluated vascular territories, in which no significant ($\geq 50\%$) DSA spasm was identified. 25% of territories with significant spasm had minimal perfusion deficits by ASL. Expert neurointerventionalists also agreed that having ASL images available prior to performing DSA would have changed treatment recommendations in 60% of cases. Blinded two-reader neurointerventional assessment of ASL images suggested that evaluation of ASL-derived CBF would have prevented 3 of 10 patients from undergoing an unnecessary DSA.

CONCLUSION

Perfusion information from MDpCASL prior to DSA may reduce unnecessary DSA in select patients and modify therapy in others, possibly improving patient triage and management.

CLINICAL RELEVANCE/APPLICATION

Obtaining MDpCASL prior to DSA may alter treatment in patients suspected of VSP following aSAH.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Yoshimi Anzai, MD - 2014 Honored Educator

MSSR44

RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

Wednesday, Dec. 2 3:30PM - 5:00PM Location: S402AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Moderator*) Nothing to Disclose
Andras Palko, MD, PhD, Szeged, Hungary (*Moderator*) Medical Advisory Board, Affidea Group;

Sub-Events

MSSR44A Polytrauma

Participants

Ulrich Linsenmaler, MD, Munich, Germany (*Presenter*) Nothing to Disclose

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

Multiple trauma / polytrauma remains the leading cause of death in a patient population below the age of 45 years. Modern Emergency Radiology plays today a key role in an interdisciplinary team guiding diagnosis and treatment in the initial clinical workup. This lecture will cover the following topics: To describe background, incidence and regional differences in patients with polytrauma / multiple trauma. To appreciate the clinical significance and to analyze critical triage criteria to undergo ER / shock room admission and concepts of initial clinical management (ATLS). To review imaging techniques and radiological management and logistic concepts for patients with polytrauma / multiple trauma within a clinical algorithm. To review the use of whole body computed tomography (WBCT), CTA as well as conventional radiography (CR) and ultrasound (US) in the initial work-up. To describe common and uncommon imaging findings. Image reading and data management, individualized CT protocols and outcome control.

MSSR44B Challenges of Imaging Pediatric Abdominal Emergencies

Participants

Susan D. John, MD, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the variations of pathology that cause abdominal pain and vomiting in infants and children. 2) Plan safe and effective imaging protocols using US, CT, and MRI. 3) Recognize pitfalls in the diagnosis of pediatric abdominal emergencies with imaging.

ABSTRACT

MSSR44C Imaging in ENT Emergencies

Participants

Diego B. Nunez JR, MD, MPH, New Haven, CT, (diego.nunez@yale.edu) (*Presenter*) Nothing to Disclose

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

SPSC41

Controversy Session: US, CT, or MR Imaging in Possible Appendicitis in Children: Three Pegs and Often Only One Hole

Wednesday, Dec. 2 4:30PM - 6:00PM Location: E451A



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Nancy R. Fefferman, MD, New York, NY, (nancy.fefferman@nyumc.org) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

Sub-Events

SPSC41A US

Participants

Nancy R. Fefferman, MD, New York, NY, (nancy.fefferman@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the advantages, disadvantages and limitations of US as an effective imaging modality in the diagnosis of appendicitis in children. 2) Review the current literature addressing the diagnostic performance of US for pediatric appendicitis. 3) Discuss the role of US in the imaging evaluation of suspected appendicitis in children.

ABSTRACT

SPSC41B CT

Participants

Michael J. Callahan, MD, Boston, MA, (michael.callahan@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Highlight the advantages, disadvantages and versatility of computed tomography for the diagnosis of suspected acute appendicitis in children. 2) Describe published sensitivity and specificity values for computed tomography in the setting of suspected acute appendicitis in the pediatric population. 3) Explain the challenges and potential barriers for standardization of pediatric appendicitis clinical practice guidelines at academic and non-academic centers.

SPSC41C MR

Participants

R. Paul Guilleman, MD, Houston, TX, (rpguille@texaschildrens.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an MRI protocol for suspected pediatric appendicitis. 2) Estimate the diagnostic efficacy of MRI for suspected pediatric appendicitis. 3) Appraise how radiation-induced cancer risks and diagnostic performance characteristics influence the optimal selection of US, CT and MRI for suspected pediatric appendicitis.

Controversy Session: Concussion and Dementia: Will Football be the Tobacco of this Century?

Wednesday, Dec. 2 4:30PM - 6:00PM Location: E351



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Michael N. Brant-Zawadzki, MD, Newport Beach, CA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the functional as well pathophysiologic consequences of concussion. 2) Understand the overlap between chronic traumatic encephalopathy and Alzheimer's disease. 3) Understand the prevalence of chronic traumatic encephalopathy, its demographics, and distinguish those features from the more widely prevalent aspects of Alzheimer's dementia related disorders. 4) Properly understand the prognostic risk of contact sports as they relate to the prevalence of dementia in the population at large.

Sub-Events**SPSC42A CTE (Chronic Traumatic Encephalopathy) and Dementia: Causation?****Participants**

Michael T. Modic, MD, Cleveland, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSC42B Guilt by Association**Participants**

William R. Shankle, MD, MS, Newport Beach, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the distinction between correlation and cause. 2) Understand how one can distinguish between a reported effect that is causal and one that is associational. 3) Apply this approach to Traumatic Brain Injury to examine the evidence of a causal vs. associative effect.

ABSTRACT

Guilt By AssociationWR Shankle, MS MD FACPTraumatic Brain Injury (TBI) is one condition where it seems intuitively obvious that brain trauma CAUSES brain dysfunction. In the past decade, methodological advances in computer science have led to the development of a mathematics called CAUSAL INFERENCE, that can be used to analyze risk factors and distinguish whether they are likely to CAUSE an outcome (e.g. brain dysfunction) or are simply ASSOCIATED with the outcome's occurrence. This methodology combines probability theory with graph theory to accomplish this distinction. Causal Inference is very useful because it can analyze observational and other non-randomized studies. Interestingly, a search of the TBI literature identified no studies that have tested the assumption that TBI CAUSES brain dysfunction. One very useful causal inference method, called Targeted Maximum Likelihood Estimation, has been used in observational studies to minimize the chance that a causal effect is not detected due to some type of bias in the study. In simple terms, I will present how TMLE can be used to test the assumption that TBI causes brain dysfunction. Performing such a study on observational data would be of enormous value because of the extremely high probability that TBI does, in fact, cause brain dysfunction. Other risk factors, in which the question of causality is much less clear, can then be examined using TMLE with reference to what TMLE informs us about about TBI.

URL

Controversy Session: CT Perfusion (CTP) and Stroke: RIP?

Wednesday, Dec. 2 4:30PM - 6:00PM Location: S406B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Gordon K. Sze, MD, New Haven, CT (*Moderator*) Investigator, Remedy Pharmaceuticals, Inc

Sub-Events**SPSC43A CTP is Dead****Participants**

Ramon G. Gonzalez, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the most important acute ischemic stroke physiology factors for patient outcomes and their relative importance. 2) Recognize the role of the ischemic core size in selecting patients with large vessel occlusion for endovascular therapy. 3) Review the animal literature on the use of CT perfusion for measuring the ischemic core and its value compared to diffusion MRI. 4) Recognize the source and magnitude of measurement error when using CTP including using the 95% confidence interval in ischemic core estimates in individual patients.

ABSTRACT

Recent trials have shown that intervention produces favorable outcomes when acute ischemic stroke patients are selected using CTP. Does that mean that CTP is adequate to decide whether an INDIVIDUAL patient should undergo treatment? The answer is "no". CTP is simply too imprecise to reliably measure the infarct core - the critical parameter for excluding from therapy patients who are at greatest risk of hemorrhagic complications, and are unlikely to benefit. Moreover, there is a more precise alternative, diffusion MRI. CTP measures hemodynamics, not tissue status. Hence, although a marker for irreversible injury absent timely reperfusion, CTP - which reflects a snapshot-in-time - is not a marker for treatment futility. Not surprisingly, validation studies in animal models are sparse and have not been reproduced. All published clinical data are consistent: CTP core estimates have high error. Although CTP may be adequate for selection of patients with small cores, where large measurement errors are of little consequence, the cost is exclusion of many with a high likelihood of treatment benefit. CTP core-lesions segmented using automated software offer the illusion of quantitative accuracy that simply does not exist. CTP and DWI are different. The inherently poor signal-to-noise ratio (SNR) of post-processed CTP images is another fundamental weakness of the technique. Low SNR measurements may be useful if repeated and a mean calculated; this cannot be done for individual patients. That a strong linear correlation exists between CTP and DWI derived ischemic lesion volumes is not surprising, since both result from the same arterial occlusion. High correlation in a population, however, does not confer high measurement accuracy in an individual. As Bland and Altman pointed out almost 30 years ago, regression analyses are inappropriate to judge the validity of a quantitative clinical test. More appropriate are difference tests that establish the 95% confidence limits. As shown by Schaefer et al, a CBF core measurement of 70 ml could actually range from 11-to-124 ml within the 95% confidence limits; other papers in the CTP literature reveal similar variability. Although this large variability does not preclude using CTP to enroll patients into clinical trials, it does make such selection inherently less efficient compared to using "reference standard" DWI. Indeed, power calculations show that, for a simulated treatment study designed to detect a 20 ml improvement in final infarct volume, using CTP instead of DWI would require at least twice as many patients to reach significance. Given CTP's relative inaccuracy in delineating "core", what is the reason for the good outcome rate using a CTP-based selection strategy? The answer lies in its patient selection criteria. The successful trials used a highly conservative selection strategy, "cherry picking" the very best patients with very small cores who were likely to do well even with alteplase alone. Targeting small cores minimizes the effects of large measurement errors, at the cost of excluding many who might benefit. All agree that clinical trials have demonstrated that thrombolysis and thrombectomy are effective treatments for stroke caused by large vessel occlusion. All agree that identifying a target occlusion is important, and that measurement of the infarct-core is critical. The question centers on whether core measurement by CTP is sufficiently precise to be used for treatment selection in INDIVIDUAL patients? A wealth of theoretical, experimental, and clinical evidence suggests the answer is "no". Many argue that "CTP may be short of perfect, yet close enough." Would an internist accept a blood glucose or INR measurement with >50% error as "close enough"? No, she would not. Why, then, should stroke physicians accept a core measurement error of >50% as "close enough"? Clearly, they should not - especially when a more accurate alternative is readily available. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. Lancet. 1986 Feb 8;1(8476):307-10. Schaefer PW, Souza L, Kamalian S, Hirsch JA, Yoo AJ, Kamalian S, Gonzalez RG, Lev MH. Limited reliability of computed tomographic perfusion acute infarct volume measurements compared with diffusion-weighted imaging in anterior circulation stroke. Stroke. 2015 Feb;46(2):419-24.

SPSC43B CTP is Underutilized**Participants**

Max Wintermark, MD, Lausanne, Switzerland, (max.wintermark@gmail.com) (*Presenter*) Advisory Board, General Electric Company;

LEARNING OBJECTIVES

1) To review the indications of perfusion CT imaging in patients suspected of acute ischemic stroke.

ABSTRACT

Perfusion-CT is an imaging method used to assess the ischemic core and penumbra in acute stroke patients. A prospective multi-center study reported that an absolute cerebral blood volume (CBV) threshold reflected the ischemic core and that a relative mean transit time (MTT) threshold most accurately reflected the penumbra. However, in more recent and larger studies, relative cerebral blood flow (rCBF) was found to be more predictive of the ischemic core (nonviable tissue) than absolute CBV. There is a need for

standardization of the PCT methods used to define the ischemic core and the penumbra. Determination of tissue viability based on imaging has the potential to individualize thrombolytic therapy and extend the therapeutic time window for some acute stroke patients. Although perfusion imaging has been incorporated into acute stroke imaging algorithms at some institutions, its clinical utility has not been proven. It is important to note that perfusion imaging has many applications beyond characterization of the penumbra and triage of patients to acute revascularization therapy. The negative results of the MR RESCUE trial do not negate these potential benefits. These applications include, but are not limited to: (1) improving the sensitivity and accuracy of stroke diagnosis (in some cases, a lesion on PCT leads to more careful scrutiny and identification of a vascular occlusion that was not evident prospectively, particularly in the M2 and more distal MCA branches), (2) excluding stroke mimics, (3) better assessment of the ischemic core and collateral flow, and (4) prediction of hemorrhagic transformation and malignant edema.

URL

Controversy Session: Ultrasound versus CT for Suspected Renal Colic: Which Modality Rocks in the ER?

Wednesday, Dec. 2 4:30PM - 6:00PM Location: S404CD



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Judy Yee, MD, San Francisco, CA (*Moderator*) Research Grant, EchoPixel, Inc

Mitchell E. Tublin, MD, Pittsburgh, PA (*Presenter*) Nothing to Disclose

Aaron D. Sodickson, MD, PhD, Wayland, MA, (asodickson@bwh.harvard.edu) (*Presenter*) Research Grant, Siemens AG; Consultant, Bracco Group

D. Mark Courtney, MD, MSc, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the advantages of ultrasound and present a cost effective, rational algorithm for its use in the evaluation of ER patients with potential renal colic. 2) Understand the benefits of CT over ultrasound in ER imaging of suspected renal colic. 3) Understand the perspective and preferences of the ER physician for the workup of renal colic and the effect on clinical workflow.

Honored Educators

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Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Emergency Radiology Thursday Case of the Day

Thursday, Dec. 3 7:00AM - 11:59PM Location: Case of Day, Learning Center

ER

AMA PRA Category 1 Credit™: .50

Participants

Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Presenter*) Nothing to Disclose
 Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
 Melanie Wegener, Garden City, NY (*Abstract Co-Author*) Nothing to Disclose
 Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Patrick D. McLaughlin, FFRCSI, Cork, Ireland (*Abstract Co-Author*) Speaker, Siemens AG
 Ania Z. Kielar, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
 Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
 Puneet Bhargava, MD, Shoreline, WA (*Abstract Co-Author*) Editor, Reed Elsevier
 Nicholas M. Beckmann, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
 Ritu Bordia, MBBS, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Recognize key imaging findings on multimodality imaging of emergency/trauma patients. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Recommend appropriate management including image-guided interventions.

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator
 Jorge A. Soto, MD - 2014 Honored Educator
 Jorge A. Soto, MD - 2015 Honored Educator
 Douglas S. Katz, MD - 2013 Honored Educator
 Douglas S. Katz, MD - 2015 Honored Educator
 Puneet Bhargava, MD - 2015 Honored Educator

RC605

Brain Aneurysms

Thursday, Dec. 3 8:30AM - 10:00AM Location: S102AB



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50



Discussions may include off-label uses.

Participants

Steven W. Hetts, MD, San Francisco, CA (*Moderator*) Consultant, Silk Road Medical Inc Consultant, Medina Medical Inc Research Grant, Stryker Corporation Data Safety Monitoring Board, Stryker Corporation
Darren Orbach, MD, Boston, MA, (darren.orbach@childrens.harvard.edu) (*Moderator*) Nothing to Disclose

Sub-Events

RC605A Management of the Unruptured Brain Aneurysm

Participants

Robert Fahed, MD, MSc, Quebec, QC (*Presenter*) Nothing to Disclose

Handout: Jean Raymond

http://abstract.rsna.org/uploads/2015/15000018/RAYMONDJ_RC605A_61267.pdf

RC605B Pediatric Arteriopathy: A Neurointerventionalist's Perspective

Participants

Darren Orbach, MD, Boston, MA, (darren.orbach@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the most common causes of pediatric arterial ischemic stroke. 2) Contextualize arterial ischemic stroke within overall cerebrovascular conditions in children (hemorrhagic and venous). 3) Distinguish between progressive and fixed arteriopathies, in terms of natural history and treatment strategies. 4) Differentiate etiologies and treatment challenges of stroke in children versus adults.

ABSTRACT

RC605C Flow-diversion Technology for Treatment of Cerebral Aneurysms

Participants

Philip M. Meyers, MD, New York, NY, (pmm2002@cumc.columbia.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will understand the design of certain flow-diverters used to treat cerebral aneurysms. 2) The participant will be familiar with the on-label and some off-label application of the most commonly used flow diverters in the United States. 3) The participant will be familiar with common radiographic outcome metrics, imaging markers for clinical success and potential complications.

ABSTRACT

Flow diversion is becoming an increasingly important method to treat cerebral aneurysms, now encompassing nearly 40% of all endovascular treatment procedures for unruptured intracranial aneurysms. In this lecture, the meeting participant will learn about the design and application of flow diversion technologies to the treatment of cerebral aneurysms and about some of the imaging manifestations associated with their use.

Emergency Radiology Series: Contemporary Topics in Imaging of Trauma

Thursday, Dec. 3 8:30AM - 12:00PM Location: S405AB



AMA PRA Category 1 Credits™: 3.25
ARRT Category A+ Credits: 4.00

Participants

Scott D. Steenburg, MD, Zionsville, IN, (ssteenbu@iuhealth.org) (*Moderator*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Moderator*) Institutional research agreement, Siemens AG
Martin L. Gunn, MBChB, Seattle, WA, (marting@uw.edu) (*Moderator*) Research support, Koninklijke Philips NV; Spouse, Consultant, Wolters Kluwer NV; Medical Advisor, TransformativeMed, Inc;

Sub-Events

RC608-01 Current Issues in Trauma CT Protocols

Thursday, Dec. 3 8:30AM - 8:55AM Location: S405AB

Participants

Martin L. Gunn, MBChB, Seattle, WA, (marting@uw.edu) (*Presenter*) Research support, Koninklijke Philips NV; Spouse, Consultant, Wolters Kluwer NV; Medical Advisor, TransformativeMed, Inc;

LEARNING OBJECTIVES

1) Summarize challenges that are encountered when performing trauma CT in the ED. 2) Identify tradeoffs that are encountered when deciding 'who' to scan and 'how' to scan. 3) Understand CT techniques that can be used to optimize radiation dose, contrast use, workflow, and injury detection.

ABSTRACT

RC608-02 Is There Any Prognostic Biomarker of Computed Tomography (CT) Images in Patients with Blunt Trauma?: A Single Trauma Center's Experience

Thursday, Dec. 3 8:55AM - 9:05AM Location: S405AB

Participants

Yasutaka Baba, MD, Hiroshima, Japan (*Presenter*) Nothing to Disclose
Masaki Ishikawa, MD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Kenji Kajiura, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Wataru Fukumoto, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuo Awai, MD, Hiroshima, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, Hitachi, Ltd; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Medical Advisor, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Nemoto-Kyourindo; ; ; ;

PURPOSE

To investigate the prognostic biomarker of CT images in patients with blunt trauma.

METHOD AND MATERIALS

From April 2014 to March 2015, 1077 patients (pts) were admitted to ER (emergency room) unit of our hospital. Among them, total 89 traumatized patients (male 58 pts, female 31 pts, average age 57.6 year-old) who underwent biphasic contrast enhanced CT were enrolled in this study. The causes of trauma were motor vehicle accident (MVA) in 52 pts, fallen accident in 26 pts, stab wound in 3 pts, and others in 8 pts. Radiological and surgical interventional treatments were performed in 10 pts and in 42 pts, respectively. Patient's status, laboratory data, blunt trauma associated score and CT signs as prognostic biomarker were statistically correlated with the mortality.

RESULTS

Among the patient's status, laboratory data, blunt trauma associated score, there was a statistically significant correlation between the mortality and low maximal blood pressure ($p=0.0041$), tachycardia ($p=0.0236$), low sPO₂ ($p<0.0001$), low scores of GCS (Glasgow Coma Scale) ($p=0.0014$), high scores of injury severity score (ISS) ($p<0.0001$), low serum hemoglobin level ($p=0.0254$), base excess ($p=0.0002$), and chest blunt trauma ($p=0.0155$). Meanwhile, among the CT signs as prognostic biomarker, there was a statistically significant correlation between the mortality and the intense adrenal enhancement (IAE) at early phase ($p<0.0001$), the flattening of the inferior vena cava (FIVC) ($p=0.0016$) and the shock bowel ($p=0.0058$).

CONCLUSION

It is important to recognize not only the patient's derived information but also the IAE, FIVC and shock bowel as predictive biomarker on biphasic CT images in patients with blunt trauma because the early intervention is required.

CLINICAL RELEVANCE/APPLICATION

Biphasic CT images could provide the information of critically ill patients with blunt trauma and lead us to share decision-making in the treatment.

RC608-03 Pelvic Angiography Project ASER (PAPA) Study - A Retrospective Multicenter Cohort Study of Blunt Pelvic Trauma Patients Who Undergo Catheter Angiography

Thursday, Dec. 3 9:05AM - 9:15AM Location: S405AB

Participants

Ken F. Linnau, MD, MS, Seattle, WA (*Presenter*) Speaker, Siemens AG; Royalties, Cambridge University Press;
Bharti Khurana, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Kellie L. Sheehan, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
David Dreizin, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Matthew T. Heller, MD, Pittsburgh, PA (*Abstract Co-Author*) Consultant, Reed Elsevier; Author, Reed Elsevier
Keith D. Herr, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Scott D. Steenburg, MD, Zionsville, IN (*Abstract Co-Author*) Nothing to Disclose
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David J. Nickels, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
Hani H. Abujudeh, MD, MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ludo F. Beenen, MD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess triage pathways and imaging findings in blunt pelvic trauma patients who underwent catheter angiography and establish practice pattern variation and effectiveness of CECT.

METHOD AND MATERIALS

This retrospective multicenter cohort study from 12 level-1-trauma centers in the United States, Canada and Europe included victims of blunt trauma with pelvic fracture and subsequent conventional catheter angiography for treatment of arterial bleeding. Patient data including demographics, clinical and imaging variables prior to angiography was abstracted at each center and sent to a central data repository. Triage algorithms and imaging protocols of each participating center were obtained through a web-based survey. Descriptive, univariate and multivariate analysis was performed. Mixed-effects multivariate logistic regression analysis which accounted for site heterogeneity was performed.

RESULTS

813 patients (37% women, median age 50 yrs, 24% > 65 yrs, 25% transfers) from 2009 to 2013 were included. The median Injury Severity Score (ISS) was 34 with most injuries due to motor vehicles. Overall, 61 (7.5 %) patients died within 24 hrs of admission. Imaging work-up varied with 3 of 12 centers always performing CECT prior to conventional angiography. Pelvic radiographs were obtained in 88% patients and 62% had FAST during initial resuscitation. CECT was obtained in 77% of patients before angiography. ISS was significantly higher in those who had no CECT (39 vs 33). Door-to-angio time was 3.8 hrs. Overall, 69% of patients had catheter angiographic findings of any arterial injury, 55% had active contrast extravasation. The positive angio rate was 67% if CECT was obtained and 76% if no CECT was done before angiography ($p = 0.024$). Site-adjusted multivariate logistic regression accounting for laparotomy, pelvic binder, pelvic packing, any transfusions, HR >120, hematocrit revealed an odds ratio for positive angiography of 0.83 (CI: 0.53-1.31, $p = 0.42$) if CECT was obtained.

CONCLUSION

Although CECT is widely utilized, the rate of arterial vascular injury on conventional catheter angiography is not substantially different in blunt pelvic trauma patients who do not get CECT before intervention.

CLINICAL RELEVANCE/APPLICATION

Although catheter angiography is recommended in hemodynamically unstable patients with pelvic fractures, it remains unclear if contrast-enhanced computed tomography (CECT) aids in triage of such patients to angiography.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: <https://www.rsna.org/Honored-Educator-Award/>

Bharti Khurana, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

RC608-04 CT of Neck Injuries

Thursday, Dec. 3 9:15AM - 9:40AM Location: S405AB

Participants

Clint W. Sliker, MD, Ellicott City, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the imaging appearances of injuries to a number of important neck structures other than the spine and cerebrovasculature, including the larynx, pharynx, trachea, esophagus, and external carotid artery branches. 2) Understand the limitations and pitfalls of CT when used to diagnose injuries to these structures.

ABSTRACT

Active Handout: Clint W. Sliker

<http://abstract.rsna.org/uploads/2015/15003328/RC608-04.pdf>

RC608-05 Immediate Total-body CT Scanning versus Conventional Imaging and Selective CT Scanning in Severe Trauma Patients: A Randomised Controlled Trial (REACT-2 Trial)

Thursday, Dec. 3 9:40AM - 9:50AM Location: S405AB

Participants

Joanne C. Sierink, MD, PhD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Kaij Treskes, MD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Ludo F. Beenen, MD, Amsterdam, Netherlands (*Presenter*) Nothing to Disclose
Joachim Hohmann, MD, DIPLPHYS, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Michael J. Edwards, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Benn J. Beuker, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Dennis den Hartog, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marcel Dijkgraaf, PHD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Jan S. Luitse, MD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Markus W. Hollmann, MD, PhD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Carel Goslings, MD, PhD, Amsterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recent literature suggests a survival benefit for trauma patients when they are evaluated with total-body Computed Tomography (TBCT) scanning during the initial trauma evaluation. Since level-1 evidence is lacking this study aimed to assess the value of immediate total-body CT scanning in severely injured trauma patients.

METHOD AND MATERIALS

In this multicentre clinical trial, we randomly assigned 541 trauma patients to immediate TBCT scanning and 542 patients to the standard workup with conventional imaging supplemented with selective CT scanning. Trauma patients having compromised vital parameters, clinical suspicion of life-threatening injuries or severe injury mechanisms were eligible. The primary endpoint was inhospital mortality. Secondary endpoints were clinically relevant time intervals, radiation exposure, missed injuries and direct medical costs.

RESULTS

The in-hospital mortality rate was not statistically different between groups (TBCT 15.9% vs. standard 15.7%, $P=0.923$). Subgroup analyses in polytrauma patients also did not reveal a significant difference between groups (TBCT 22.4% vs. standard 24.8%, $P=0.457$). Imaging time in the trauma room was decreased in the TBCT group (30 min vs. 37 min, $P<0.001$). More patients in the standard workup group received a lower effective radiation dose during the total hospital stay (21.0mSv [IQR=20.9-25.2] versus 20.6mSv [IQR=11.8-27.6], $P<0.001$). The number of missed injuries found during the tertiary survey were not different between groups (45 [8.8%] vs. 53 [10.1%], $P=0.448$). The medical costs were €24,967 (95% CI: €21,880- €28,752) for the TBCT group and €26,995 (95% CI: €23,326-€30,908) for the standard workup group ($P=0.439$).

CONCLUSION

Total-body CT scanning was safe, shortened the imaging time and did not increase the medical costs, but it did not improve survival, and most patients in the standard workup group received a lower radiation dose.

CLINICAL RELEVANCE/APPLICATION

Total-body Computed Tomography can be used for evaluation in trauma as it is safe and fast. Further research should focus on improvement of selection of trauma patients for evaluation by TBCT scanning.

RC608-06 Utility of MDCT Findings in Predicting Patient Management Outcomes in Renal Trauma

Thursday, Dec. 3 9:50AM - 10:00AM Location: S405AB

Participants

Arthur Baghdanian, MD, Boston, MA (*Presenter*) Nothing to Disclose
Armonde Baghdanian, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Anthony S. Armetta, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the utility of MDCT findings in predicting clinical outcomes in renal trauma.

METHOD AND MATERIALS

This retrospective study was IRB approved and HIPAA compliant; informed consent was waived. Adult patients suffering from blunt or penetrating renal trauma from 01/01/2006 to 12/31/2013 were included. During this interval, 162 patients met this inclusion criteria (males, $n=121$; females, $n=41$; mean age = 33 years-old, range 15-88 years; blunt trauma, $n=114$; penetrating trauma, $n=48$). Renal injury was graded based on the AAST kidney injury scale. Additional variables that were blind read from abdominopelvic CT studies as well as recorded from the EMR included: active extravasation, collecting system injury, embolization, collecting system stenting and surgical management. Fisher's exact test was used to evaluate the association between: active extravasation and operative or endovascular therapy; AAST score and operative or endovascular therapy; and AAST score and collecting system stenting.

RESULTS

AAST kidney injury score: grade 1 ($n=26$), grade 2 ($n=33$), grade 3 ($n=61$), grade 4 ($n=37$), and grade 5 ($n=5$). Active extravasation ($n=25$) and collecting system injury ($n=20$). 13/162 (8%) patients received further management related to renal trauma. 2 patients (1%) required renal artery embolization. 11 patients underwent surgery: nephrectomy ($n=2$; 1%), renorrhaphy ($n=3$; 2%), and collecting system stent ($n=6$; 3.7%). 7/25 patients (13/25 grade 3/4; 12/25 grade 1/2/3) with active extravasation received surgical management or embolization. There was a statistically significant correlation between active extravasation and

surgical or endovascular therapy ($p<0.001$). There was a statistically significant correlation between high grade injury (grade 4/5) with both active extravasation ($p=0.002$) and collecting system stenting ($p<0.001$). Finally, there was no statistically significant correlation between high vs low grade of injury with surgical or endovascular management ($p=0.07$).

CONCLUSION

Active extravasation is a significant predictor of surgical or endovascular management of renal trauma. The AAST grade does not correlate with the need for surgical or endovascular management, however, it does correlate with collecting system injury and intervention.

CLINICAL RELEVANCE/APPLICATION

An imaging based renal trauma scoring system that incorporates active extravasation may be necessary to more accurately predict patient outcomes.

Honored Educators

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Jorge A. Soto, MD - 2013 Honored Educator

Jorge A. Soto, MD - 2014 Honored Educator

Jorge A. Soto, MD - 2015 Honored Educator

RC608-07 Question and Answer

Thursday, Dec. 3 10:00AM - 10:15AM Location: S405AB

Participants

RC608-08 Imaging of Thoracic Trauma

Thursday, Dec. 3 10:15AM - 10:40AM Location: S405AB

Participants

Constantine A. Raptis, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review key imaging findings which need to be identified on the trauma chest radiograph. 2) Discuss indications for thoracic CT imaging in trauma patients. 3) Introduce an organized approach to the chest CT in thoracic trauma. 4) Identify and understand important findings which are commonly seen on chest CT examinations in trauma.

ABSTRACT

RC608-09 'Time to Revisit Major Trauma Imaging Approach?': Lung Ultrasound-FAST (LUS-FAST) Plus WB-MDCT in Pneumothorax Diagnosis

Thursday, Dec. 3 10:40AM - 10:50AM Location: S405AB

Participants

Stefania Ianniello, Roma, Italy (*Presenter*) Nothing to Disclose

Michele Galluzzo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

Barbara Sessa, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

Claudio Ajmone Cat, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

Giuseppe Nardi, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

Vittorio Miele, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In Major Trauma (ISS - Injury Severity Score ≥ 15), imaging approach of A.T.L.S. take into account supine- CXR for pneumothorax detection, during Primary Survey that have shown low accuracy in the assessment of pneumothorax while it's clearly demonstrated the superiority of lung ultrasound for this diagnosis. The aim of our study was to evaluate the clinical impact for pneumothorax diagnosis of new Imaging approach in a Trauma dedicated logistical context (Shock Room, CT Room, Operating Room strictly closed; Emergency Radiologist 24h/7days): only extended (to thorax)-focused assessment with sonography in trauma (e-FAST), during Primary Survey, and Whole-Body Multidetector Computed Tomography (MDCT) as secondary, during two years of experience in our Level I Trauma Center.

METHOD AND MATERIALS

This was a retrospective case-series study involving 660 consecutive adult patients admitted to the our Emergency Department (422men and 238women) (average age: 41y- age range: 18-81y) between January 2013-December 2014 for a Major Trauma. We evaluated the accuracy of lung ultrasonography in the detection of pneumothorax (compared with the results of Multidetector Computed Tomography (MDCT) and of invasive interventions (thoracostomy tube placement), and timing of this imaging approach.

RESULTS

Among the 1320 lung fields included in the study, we observed 264 pneumothoraces with thoracic MDCT scans. The e-FAST detected 242 pneumothoraces and didn't recognize 22 pneumothoraces. About 2 years, total diagnostic performance of L.US was: sensitivity 92%, specificity 100%, PPV 100%, NPV 98%, Accuracy 98%. At Major Trauma's arrival, median time to achieve pneumothorax diagnosis with Extended was 3 min. (1-5'). These results demonstrate that (e-FAST + WB-MDCT) has good results, reduces time (e-FAST within 5'; WB-MDCT within 40') and effectively omits many diagnostic steps between clinical suspicion and definitive proof of injuries that require immediate therapeutic attention. Beyond pneumothorax diagnosis, further studies will occur to analyze clinical impact for every single others traumatic lesions.

CONCLUSION

This new Imaging approach, Lung Ultrasound-FAST during primary survey, and WB-MDCT as secondary, demonstrate high accuracy to achieve avoidable pneumothorax's death; CT scanner should be placed very close to, or in the trauma room; Emergency Radiologist available 24h/7d.

CLINICAL RELEVANCE/APPLICATION

A new powerful Ultrasound field: pneumothorax diagnosis.

RC608-10 Value of Contrast Enhanced CT in Detecting Blunt Traumatic Injury of the Diaphragm: Retrospective Review

Thursday, Dec. 3 10:50AM - 11:00AM Location: S405AB

Participants

Daniel Lamus, MD, San Antonio, TX (*Presenter*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Brian Eastridge, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Abdul Alarhayem, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Retrospectively review the accuracy of MDCT for the detection of acute blunt traumatic injury of the diaphragm. Identify the most relevant imaging signs of diaphragmatic injury.

METHOD AND MATERIALS

A waiver for informed consent was granted by the institutional review board. We retrospectively reviewed the records of all patients admitted to our Level I trauma center with intraoperative findings of diaphragmatic injury between 2005 and 2015. Our study was limited to the patients with blunt trauma and a total of 57 patients met this criteria. A group of 10 patients were excluded from the analysis, since diagnosis was made with the initial AP chest radiograph or with the scout view and therefore underwent corrective surgery before being scanned. An additional patient was excluded given that imaging studies were not available.

RESULTS

The diagnosis of diaphragmatic injury was confirmed by using the intraoperative findings as the reference standard. Review of the official radiologic interpretation at the time of admission, yielded a sensitivity of 71% ($p < 0.005$). A secondary assessment of the available images was also conducted, including a systematic evaluation for the presence of alternative signs of diaphragmatic injury that have been previously described by others. This approach resulted in an increased sensitivity of 93% ($p < 0.005$). Multivariate analysis including laterality of the injury was also included to complement the statistical analysis.

CONCLUSION

To our knowledge this is the largest series of blunt diaphragmatic injury in the English literature. Left sided injuries are more evident and usually present as herniation while diaphragmatic thickening/hematoma was highly specific of right sided injuries. MDCT is an useful tool in the detection of blunt diaphragmatic injuries; the use of a systematic approach may increase its accuracy.

CLINICAL RELEVANCE/APPLICATION

The widespread use of MDCT in the evaluation of patients with major trauma has improved the detection and characterization of injuries to most organs and structures. In spite of the technologic advances, the detection of diaphragmatic injury remains a diagnostic challenge in the setting of acute trauma. Ischemia to the bowel and other structures has been described as early as 24 hours after the initial injury, hence in the era of nonoperative management of abdominal trauma, timely diagnosis and operative repair of diaphragmatic injury is crucial to avoid complications.

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator

RC608-11 Hepatic Injuries

Thursday, Dec. 3 11:00AM - 11:25AM Location: S405AB

Participants

Kathirkamanathan Shanmuganathan, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate the spectrum of traumatic liver injury. 2) Discuss the performance and utility of late arterial and portal venous phase images. 3) Discuss the relevance of the various CT findings to management.

RC608-12 Blunt Bowel and Mesenteric Injury: Can We Grade It? Yes We Can!

Thursday, Dec. 3 11:25AM - 11:35AM Location: S405AB

Participants

Andres R. Ayoob, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
James T. Lee, MD, Lexington, KY (*Presenter*) Nothing to Disclose

Gustav A. Blomquist, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
David J. Nickels, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
Phillip Chang, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT grading of traumatic solid organ injuries is well established. A grading scale based on CT findings for blunt bowel or mesenteric injuries does not exist [2,3]. With the advent of high speed, multi-detector CT we hypothesize that blunt bowel and mesenteric injuries requiring operative intervention can be graded by CT imaging.

METHOD AND MATERIALS

IRB approved, retrospective review of our level-I ACS verified trauma center database of patients with blunt trauma that had both a multi-detector CT scan and laparotomy from 1/2010 to 9/2011 were included. A single trauma surgeon reviewed operative reports and determined the primary outcome of bowel/mesenteric injury requiring surgical intervention (IRSI). The first 20 patients with IRSI were randomly matched to 20 patients during the same study period without IRSI. 3 emergency radiology attendings were blinded and reviewed all 40 subjects'. They scored based on the scoring system developed internally. After initial individual reading session, a consensus reading session was performed on discrepant scoring. Receiver operating characteristic (ROC) curves and sensitivity/specificity analyses were performed on the scores relative to IRSI.

RESULTS

The 2 groups were matched by age, sex, injury severity score (ISS), and timing of presentation to scan and eventual operation (standardized differences < .10). No individual radiologist's scores reached both sensitivity and specificity $\geq 75\%$ relative to IRSI. AUROCs showed "good" ($>.6$) to "very good" ($>.8$) discrimination of IRSI. The consensus score AUROC of .799 is good, with .800 considered very good discrimination of the need for surgical intervention (Figure 1). The consensus score of all three radiologists of a \geq Grade 3 injury was sensitive (75%) and specific at (79%) for the need for surgical intervention. Risk for surgical intervention increased linearly with consensus score. ($R^2 = .965$) (Figure 2).

CONCLUSION

The proposed grading system demonstrates proof of concept in becoming a diagnostic tool in the management of blunt bowel and mesenteric IRSI injuries. The scale provides significant information regarding the extent of injury, need for surgery with diagnostic significance in the very first iteration of this application. Further studies are needed to validate the grading scale.

CLINICAL RELEVANCE/APPLICATION

CT grading scale for bowel and mesenteric injury is possible and may improve communication between radiologist and surgeon.

RC608-13 Inter-reader Agreement in the Detection and Classification of Pancreatic Trauma Injury on CT Using AAST Pancreatic Injury Scoring System

Thursday, Dec. 3 11:35AM - 11:45AM Location: S405AB

Participants

Marta E. Heilbrun, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose
Nickolas Byrge, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Daniel N. Sommers, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Nicole S. Winkler, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Raminder Nirula, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pancreatic injuries occur in 1-5% of blunt and penetrating trauma. Mortality may be as high as 20%, often relates to the presence of other injuries, and increases with delayed diagnosis. The sensitivity of CT ranges from 65-91%. Up to 40% of patients may show no abnormality of the pancreas on initial CT and extent of injury may be difficult to characterize. Assessment of pancreatic duct integrity is critical since disruption causes most complications. The 5-point American Association for the Surgery of Trauma (AAST) pancreas injury scale is an accepted scoring system. Intervention may be necessary if AAST ≥ 3 . The goal of this study is to determine if there is reader agreement on the presence of pancreatic injury and the extent of injury based on AAST scores on initial trauma CT.

METHOD AND MATERIALS

102 CTs from an multi-institutional AAST de-identified trauma database were reviewed by 3 fellowship trained abdominal radiologists after an initial training. Training was completed after agreement >0.6 (25 studies). Blinded to clinical information and each other, the readers assigned a binary score (Y/N) to the presence of pancreatic injury, pancreatic duct injury, a 4 point Likert item scale for confidence in injury scores and AAST score. Interrater reliability is assessed with the intraclass correlation coefficient.

RESULTS

The binary assessment of any pancreatic injury ranged from 80-93% for the 3 readers, with interrater agreement of 0.37(95%CI,0.25-0.50) and confidence of assessment 0.53(95%CI,0.40-0.64). The binary assessment of any ductal injury ranged from 31-39% with interrater agreement of 0.65(95%CI,0.52-0.75) and confidence of 0.70(95%CI,0.60-0.78). Mean AAST score ranged from 1.8-2.4. Interrater agreement for AAST score is 0.69(95%CI,0.58-0.77). The greatest disagreement related to the absence of any pancreatic injury, with 2 readers giving 21 studies no injury, but 1 reader giving 7 studies no injury.

CONCLUSION

Even with training, there was relatively poor agreement when there is no or minimal pancreas injury. There is better agreement when there is more extensive injury, especially suspected duct injury. Readers demonstrate good agreement when using the AAST injury score.

CLINICAL RELEVANCE/APPLICATION

Clinically actionable pancreatic trauma (ductal injury) is reliably recognizable on CT. The use of surgical scoring systems, such as the AAST pancreatic injury score, improves reader agreement.

Thursday, Dec. 3 11:45AM - 12:00PM Location: S405AB

Participants

MSES52

Essentials of Trauma Imaging

Thursday, Dec. 3 10:30AM - 12:00PM Location: S406B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

MSES52A Cervical Spine Trauma

Participants

Peter J. MacMahon, MD, Dublin, Ireland, (pmacmahon@mater.ie) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the stabilizing anatomical structures of the cervical spine. 2) Appraise the indications for the various cervical spine imaging modalities. 3) Classify cervical spinal injuries based on the mechanism of injury and stability. 4) Differentiate the most common cervical spine injuries. 5) Detect subtle soft tissue and bony injuries of the cervical spine.

MSES52B A Simplified Approach to Imaging Acetabular Fractures

Participants

Ustun Aydingoz, MD, Ankara, Turkey, (ustunaydingoz@yahoo.com) (*Presenter*) Speaker, AbbVie Inc; Spouse, Stockholder, Edita Medical Writing Editing Ltd; Spouse, Employee, Edita Medical Writing Editing Ltd;

LEARNING OBJECTIVES

1) Identify the imaginary lines on radiographs to determine the presence of an acetabular fracture. 2) List five most common acetabular fractures that comprise approximately 90% of all. 3) Apply an algorithm to detect the five most common acetabular fractures on radiographs and/or CT. 4) Explain the most relevant information for the clinician regarding imaging assessment of acetabular fractures.

ABSTRACT

Imaging plays an indispensable role in detecting and classifying acetabular fractures. This live activity will focus on: A) identifying acetabular fractures on radiographs and CT, B) using an algorithm to classify the five most common acetabular fractures (that comprise approximately 90% of all), and C) mentioning clinically relevant points on imaging reports to help decision-making for better management of the patient's condition.

Handout:Ustun Aydingoz

[http://abstract.rsna.org/uploads/2015/15001876/RSNA2015_MSES52B_Acetabular fx.pdf](http://abstract.rsna.org/uploads/2015/15001876/RSNA2015_MSES52B_Acetabular%20fractures.pdf)

MSES52C Blunt Trauma of Lung, Pleura, Airways, and Chest Wall

Participants

Guillermo P. Sangster, MD, Shreveport, LA, (gsangs@lsuhsc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Substantiate the advantages of multidetector computed tomography (MDCT) over Chest x-ray for the initial screening of chest trauma. 2) Identify the MDCT imaging findings of the non-vascular traumatic thoracic injuries.

ABSTRACT

Chest radiography has been the traditional screening technique to evaluate traumatic thoracic injuries. The information obtained is usually sub optimal for the diagnosis of non-vascular thoracic injuries. The benefits of MDCT for its diagnosis are discussed in this live activity. Images from our level I trauma center database are shown, including: A) Thoracic wall injuries: diaphragmatic rupture, sternum and scapular fractures, sterno-clavicular dislocation and flail chest. B) Pleuro-pulmonary injuries: contusion, laceration, herniation, pneumothorax, and hemothorax. C) Intrathoracic tracheo-bronchial laceration.

Emergency Radiology Thursday Poster Discussions

Thursday, Dec. 3 12:15PM - 12:45PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

ParticipantsClint W. Sliker, MD, Ellicott City, MD (*Moderator*) Nothing to Disclose**Sub-Events****ER237-SD-THA2 Quantification of Computed Tomography (CT) Imaging of Trauma Patients Transferred to a Tertiary Care Teaching Institution**

Station #2

Participants

Molly Wingfield, BA, Kansas City, KS (*Presenter*) Nothing to Disclose
 Jacqueline Hill, MPH, Kansas City, KS (*Abstract Co-Author*) Nothing to Disclose
 Suzanne Hunt, Kansas City, KS (*Abstract Co-Author*) Nothing to Disclose
 Jo Wick, Kansas City, KS (*Abstract Co-Author*) Nothing to Disclose
 Arnie Robinson, BS, RT, Kansas City, KS (*Abstract Co-Author*) Nothing to Disclose
 Ryan M. Ash, MD, Kansas City, KS (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify computed tomography (CT) imaging processes of incoming trauma transfers at a large tertiary care teaching institution.

METHOD AND MATERIALS

A retrospective analysis was conducted on trauma patients transferred from outside hospitals (OSHs) in 2013 to our institution. Adult patients who had one or more cervical spine (CS), maxillofacial (MF), chest (C), or abdomen/pelvis (AP) CT scans performed at an OSH within 48 hours prior to arrival were examined. Electronic medical record review provided information about patient demographics, the OSH, scan type, scan timing, scan availability upon patient arrival, and whether or not the patient was rescanned at our institution.

RESULTS

Of the 523 patients transferred to our institution in 2013, 190 met our inclusion criteria with 67% male, 90% Caucasian, and a mean age of 50 years (range: 18-97 years). Patients transferred from trauma regions directly adjacent to our institution comprised 90% of the sample. Most patients (82%) came from OSHs participating in a cloud transfer system, but only half (47%) of patient images were electronically transferred using the cloud. Seventy-eight patients (41%) had scans available in our system at the time of arrival. Of those, 42% (33) of patients were rescanned, compared to 32% (36/112) of patients without images available upon arrival. Among the thirty-three rescanned patients, two-thirds (21/33) were transferred outside normal business hours. Shorter elapsed times between OSH imaging and patient arrival were associated with rescanning ($p=0.01$), even when patient scans were available upon arrival. Mechanism of injury was also related to rescanning; the majority (59%) of fall patients with OSH scans available upon arrival were rescanned, while the minority of patients with assault and vehicle or machinery-related injuries were rescanned (11% and 36%, respectively, $p=0.02$).

CONCLUSION

Roughly one-third of trauma patients were rescanned at our institution, regardless of trauma severity or image availability in our system upon patient arrival. Reducing the incidence of rescanning will reduce excess radiation and contrast exposure, decrease patient and hospital costs, and has the potential to streamline trauma processes.

CLINICAL RELEVANCE/APPLICATION

The likelihood of receiving a CT scan during an ED visit has nearly doubled in the past decade. Reducing duplicative imaging during these visits can decrease patient exposure to unnecessary radiation.

ER239-SD-THA4 Surgically Proven Bowel and Mesenteric Trauma: Incidence and Interobserver Agreement of Individual CT Signs

Station #4

Participants

Christina A. LeBedis, MD, Boston, MA (*Presenter*) Nothing to Disclose
 Ramy Khalil, MD, BEng, Roxbury, MA (*Abstract Co-Author*) Nothing to Disclose
 David Matherly, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Stephan W. Anderson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Heidi Wing, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Peter A. Burke, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
 David D. Bates, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the incidence and interobserver agreement of CT findings in surgically proven bowel and mesenteric injury after blunt abdominal trauma.

METHOD AND MATERIALS

This retrospective study was IRB approved; informed consent was waived. All adult patients who sustained surgically proven bowel and/or mesenteric injury after blunt abdominal trauma from 1/1/2004-12/31/2013 were included. 30 patients met inclusion criteria (males n=25, females n=5, mean age 38.2 years, range 16-77 years). Two abdominal fellowship trained radiologists independently assessed the CT images and determined the presence of the following findings: intraperitoneal fluid, mesenteric hematoma/focal fat stranding, bowel wall thickening/hematoma, active extravasation of IV contrast, free air, bowel wall discontinuity and focal bowel hypoenhancement. The incidence of each sign was calculated using operative findings as the standard of reference. Interobserver agreement was measured using kappa statistics.

RESULTS

The incidence and interobserver agreement of the CT findings were: intraperitoneal fluid 93.3% ($k = 0.651$, good), mesenteric hematoma/fat stranding 83.3% ($k = 0.516$, moderate), bowel wall thickening/hematoma 40% ($k = 0.375$, fair), active extravasation of IV contrast 30% ($k = 1$, perfect), free air 23.3% ($k = 0.902$, very good), bowel wall discontinuity 3.3% ($k = 1$, perfect) and focal bowel hypoenhancement 3.3% ($k = 0.464$, moderate). 28/30 patients had at least one of these CT findings. One patient had only free fluid. Two patients had none of these CT findings, but at surgery were found to have a mesenteric hematoma adjacent to ligament of Treitz and a pinhole cecal perforation with deserosalization requiring ileocecectomy (n=1) and a duodenal hematoma that was managed conservatively (n=1).

CONCLUSION

The presence of intraperitoneal fluid and mesenteric hematoma/fat stranding are the most common CT findings in bowel and mesenteric injuries proven at laparotomy. Other findings are only moderately sensitive. A small fraction of patients may have no abnormal CT findings. Interobserver agreement for detecting these findings is fair to perfect.

CLINICAL RELEVANCE/APPLICATION

Given that bowel and mesenteric injuries in the setting of blunt trauma are rare and the clinical findings often develop late, timely diagnosis requiring operative repair depends almost exclusively on their early detection by CT. Most (but not all) patients will have at least one finding on CT.

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Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

Emergency Radiology Thursday Poster Discussions

Thursday, Dec. 3 12:45PM - 1:15PM Location: ER Community, Learning Center

ER

AMA PRA Category 1 Credit™: .50

ParticipantsClint W. Sliker, MD, Ellicott City, MD (*Moderator*) Nothing to Disclose**Sub-Events****ER240-SD-THB1 Frequency of Direct and Indirect Signs in Blunt Trauma Patients with Surgically-Proven Diaphragmatic Injury: A Decade of Multidetector Computed Tomography (MDCT) at a Level One Trauma Center**

Station #1

ParticipantsGuy T. Alexander, MD, Shreveport, LA (*Presenter*) Nothing to DiscloseJustin W. Skweres, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to DiscloseSana Naeem, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to DiscloseGuillermo P. Sangster, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose**PURPOSE**

To present the relative frequency of the direct and indirect MDCT signs seen in blunt trauma patients with known diaphragmatic injury.

METHOD AND MATERIALS

A retrospective review of the MDCT scans of blunt polytrauma patients experiencing a blunt diaphragmatic injury was performed. Between February 1, 2004 and June 30, 2014, 7,802 CT exams of the chest, abdomen, and pelvis were performed for 14,349 trauma admissions. Thirty-eight of these cases were coded as having a diaphragmatic injury in our trauma registry, of which 24 had pre-operative MDCT scans. The sensitivity and specificity of the pre-operative MDCT exam as well as the relative frequency of the direct and indirect signs in all patients with surgically-proven diaphragmatic injury were calculated. The relative frequency of associated injuries was also assessed.

RESULTS

MDCT was 85% sensitive and >99% specific in detecting diaphragmatic injury pre-operatively. Direct visualization of the disrupted hemidiaphragm was the most frequent sign, seen in 82.4% of the patients with diaphragmatic injury. This was followed by the collar sign and dependent viscera sign, seen in 76.4% and 70.6%, respectively. The most common associated injuries were fractures of the thoracic cage (76.4%) followed by splenic injury and pulmonary contusions (both 64.7%).

CONCLUSION

While visualization of a disrupted hemidiaphragm on MDCT remains the most frequent sign, other signs and associated injuries can aid in diagnosing diaphragmatic injury when direct visualization is not possible.

CLINICAL RELEVANCE/APPLICATION

Diagnosing diaphragmatic injury with cross sectional imaging is of ever-increasing importance as the percentage of blunt trauma patients managed non-operatively increases.

ER241-SD-THB2 MDCT Performance in the Evaluation of Pelvic Trauma and CT Angiography Contribution and Limits

Station #2

ParticipantsVanesa Rueda, MD, Madrid, Spain (*Presenter*) Nothing to DiscloseElena Martinez Chamorro, Madrid, Spain (*Abstract Co-Author*) Nothing to DiscloseGerardo Ayala Calvo, Madrid, Spain (*Abstract Co-Author*) Nothing to DiscloseEsteban Peghini, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to DiscloseDanitza Mandich, Madrid, Spain (*Abstract Co-Author*) Nothing to DiscloseSusana Borrueal, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose**PURPOSE**

Vascular injury in patients with pelvic trauma is a significant cause of morbidity and mortality. We aimed to compare MDCT to DSA to detect and locate the origin of active hemorrhage in the evaluation of these patients and the benefits of performing arterial phase CTA.

METHOD AND MATERIALS

We retrospectively reviewed 271 patients with severe pelvic fractures (Abbreviated Injury Scale [AIS] ≥ 4) who underwent MDCT from January 2009 to February 2015. Angiography examination was performed in 40 of these patients (14.4%) for suspected active hemorrhage and hemodynamic instability. Therapeutic embolization was archived in 37 patients, whereas the other 3 patients had no active hemorrhage. Patients with active extravasation detected in MDCT but negative results from angiography were analyzed in detail. MDCT images were transferred to a workstation to assess pelvic fractures and site of hematoma. At angiography, an abdominal and pelvic aortogram was obtained in all cases before selective catheterization of the internal iliac arteries and superselective catheterization of their branches for embolization purposes.

RESULTS

The sensitivities of the venous and arterial phase MDCT images in the evaluation of active arterial hemorrhage were 100% (37/37) and 46% (17/37), respectively. Moreover, all of the patients with positive results based on the arterial phase images were included in the group of patients with positive results based on the venous phase images. The correlation between pelvic fractured bone and bleeding vessel seen at angiography had sensitivity of 20% and specificity of 88%. The sensitivity and specificity of hematoma location in the assessment of bleeding vessel were 30% and 80%, in the order given.

CONCLUSION

MDCT provided good correlation with angiography for the detection of active arterial hemorrhage in patients with severe pelvic injuries; however the evaluation of bleeding vessel wasn't accurate. Arterial phase may be helpful, but this study showed that arterial hemorrhage may be missed and the decision-making process was not changed.

CLINICAL RELEVANCE/APPLICATION

Acute pelvic trauma: MDCT compared to DSA to detect and assess the source of active hemorrhage and limited advantages of performing CT angiography.

ER242-SD- THB3 Postmortem Computed Tomography Findings in the Thorax - Experimental Evaluation

Station #3

Participants

Hideki Hyodoh, MD, Sapporo, Japan (*Presenter*) Nothing to Disclose
Junya Shimizu, MD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Masumi Rokukawa, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Shunichiro Okazaki, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Keisuke Mizuo, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Satoshi Watanabe, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Experimental fatality models were prepared to investigate the time-related course of lung changes using postmortem CT (PMCT). This study was approved by our institutional animal ethics committee.

METHOD AND MATERIALS

Twenty-four NZW rabbits (all female, 2.30-4.30 (mean 3.10) kg) were divided into 4 fatality groups: drowning, hypothermia, suffocation, and control groups. All individuals were examined by CT (Aquilion CX, Toshiba, Japan) over the postmortem time course until the detection of putrefaction air. The aerated lung volume (ALV) was measured and the pleural space fluid was investigated on axial imaging. Bonferroni/Dunn study was employed for statistical evaluation.

RESULTS

Compared with that in the control group, the ALV increased in suffocation (3h, 4h, 5h) and decreased in drowning (1h, 2h), statistically ($p < 0.05$). The ALV was significantly maintained (increased) in hypothermia (5h, 6h, 24h) ($p < 0.05$). The earliest times of detecting pleural space fluid collection differed among the groups: control (20 h), drowning (18 h), suffocation (36 h), and hypothermia (95 h).

CONCLUSION

Early time-related lung appearances differed among the causes of death. The appearances of pleural space fluid collection also differed among the causes of death.

CLINICAL RELEVANCE/APPLICATION

Understanding the early time-related lung appearances in postmortem period can help to interpret the postmortem CT in clinical setting.

ER243-SD- THB4 Whole-body CT (WBCT) in the Management of Polytraumatized Patients

Station #4

Participants

Sarah Heinze, MD, Oldenburg, Germany (*Presenter*) Nothing to Disclose
Fadi Daaboul, Oldenburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Britta Nickau, Oldenburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Ajay Chavan, MD, Oldenburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the incidence and significance of trauma related positive findings in patients undergoing WBCT in accordance with the national guidelines for the management of polytraumatized patients.

METHOD AND MATERIALS

WBCTs of 300 polytraumatized patients were reviewed retrospectively. Trauma related skeletal and non-skeletal internal injuries as well as trauma unrelated incidental abnormalities were noted. The additional radiological diagnostic examinations resulting from these findings were analysed.

RESULTS

Of the 300 patients 96 were female and 204 male. The mean age was 42.7 ± 21.7 years. Most of the patients suffered from head injuries (118). In 48 (16 %) cases the WBCT yielded no trauma related findings (32 male, 16 female). The mean age in this subgroup (39.7 years) was slightly lower than in the entire cohort. In 279 of the 300 patients an emergency sonography (FAST; Focused Assessment with Sonography for Trauma) was performed. However, it showed pathological findings in only 48 cases. On

the other hand, WBCT revealed internal abdominal trauma in 78 cases. A correlation between CT and ultrasound was noted in only 28 patients.

CONCLUSION

WBCT without pathological findings in 16 % of the patients suggests that a more detailed clinical assessment of the patient be carried out before performing WBCT in polytraumatized patients. Although WBCT is supplemented by FAST in the majority of the patients at present, fast rarely add additional information to the WBCT findings.

CLINICAL RELEVANCE/APPLICATION

FAST could be eliminated in a large number of patients without loss of clinical information. FAST should be reserved for those patients that do not undergo WBCT. The data may help to reduce the number of WB-CT examinations which are carried out with consequent reduction in total patient exposure.

Case-based Review of the Abdomen (An Interactive Session)

Thursday, Dec. 3 1:30PM - 3:00PM Location: S406A



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

ParticipantsDouglas S. Katz, MD, Mineola, NY, (dkatz@winthrop.org) (*Director*) Nothing to Disclose**LEARNING OBJECTIVES**

1) To review a series of clinically relevant, abdominal imaging cases, with audience participation. 2) To review important concepts and potential pitfalls of: the liver on sonography; the acute abdomen on US, CT, and MR; liver transplants on multi-modality imaging; genitourinary imaging; and trauma imaging 3) To provide take home points for the audience based on specific actual case material which was instructional or problematic for the presenters.

ABSTRACT**Sub-Events****MSCA51A Hepatic Tumor Imaging****Participants**Puneet Bhargava, MD, Shoreline, WA (*Presenter*) Editor, Reed Elsevier**LEARNING OBJECTIVES**

1) Review imaging appearances of common hepatic tumors. 2) Review key imaging findings that aid in differential diagnosis.

ABSTRACT**Honored Educators**

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Puneet Bhargava, MD - 2015 Honored Educator

MSCA51B Abdominal Trauma Imaging**Participants**Savvas Nicolaou, MD, Vancouver, BC (*Presenter*) Institutional research agreement, Siemens AG**LEARNING OBJECTIVES**

1) Review the technique and protocols, with an emphasis on MDCT, for imaging of blunt and penetrating abdominal and pelvic trauma. 2) Demonstrate examples of the spectrum of injuries and the accompanying management associated with abdominal trauma, including hepatic and hepatobiliary (gallbladder) injuries, bowel and mesenteric injuries, and pelvic injuries including bladder and vascular injuries. 3) Demonstrate significance of arterial and portal venous phase imaging in the setting blunt abdominal and pelvic trauma, and the utility of whole body imaging. 4) Review new imaging applications and techniques such as iterative reconstruction and dual-energy CT, which can help better image abdominal and pelvic injuries post-trauma.

ABSTRACT**MSCA51C Acute Abdomen Imaging****Participants**Stephan W. Anderson, MD, Boston, MA (*Presenter*) Nothing to Disclose**LEARNING OBJECTIVES**

1) The participant will be exposed to the current literature related to imaging of acute abdominal pain using CT. 2) The participant will be able to apply an evidence-based approach to CT protocol development in the imaging of acute abdominal pain. 3) The participant will be able to independently evaluate the published literature in this area in a critical fashion and continue to apply recent developments to their own practice.

RC708

Imaging of the Extremities (An Interactive Session)

Thursday, Dec. 3 4:30PM - 6:00PM Location: E450B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC708A Orthopedic Hardware: All You Wanted to Know

Participants

Manickam Kumaravel, MD, FRCR, Houston, TX, (Manickam.Kumaravel@uth.tmc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the various types of orthopedic hardware in musculoskeletal imaging practice. 2) Understand the functionality of orthopedic hardware. 3) Identify the adequate positioning of hardware 4) Diagnose malpositioning and complications of hardware placement and guide treatment.

ABSTRACT

Radiologists are routinely faced with images containing orthopedic hardware. Appropriate recognition of various types of hardware is crucial for the continuation of patient care. The lecture will explain the functionality of orthopedic hardware. Illustrations of the appearance of orthopedic hardware will be made with cartoons, radiographs and Computed Tomography (CT). The attendee will be educated about identification of type of hardware; adequacy of hardware and emphasis will also be placed on diagnosis, complications and malposition of common orthopedic hardware. Guidance will also be provided with regard to appropriate report formulation.

RC708B Ankle and Foot

Participants

Ken F. Linnau, MD, MS, Seattle, WA, (klinnau@uw.edu) (*Presenter*) Speaker, Siemens AG; Royalties, Cambridge University Press;

LEARNING OBJECTIVES

1) To identify clinical scenarios which may require advanced foot and ankle imaging in the emergency department in addition to radiography. 2) To select appropriate imaging modality and exam parameters for advanced foot and ankle imaging on CT, MR and sonography. 3) To identify radiographic, CT, MR and ultrasound findings of complex or subtle foot and ankle injuries in order to aid in efficient clinical decision making and treatment planning.

ABSTRACT

The foot and ankle are very commonly injured in extremity trauma. Radiographs are the most common initial imaging study for evaluation of foot and ankle injuries. Unfortunately, radiography can be of limited utility for complete assessment of the bones and soft tissues of the foot and ankle. As a result advanced imaging, including CT, MRI or sonography may be helpful to fully characterize injuries and aid in treatment decision making. The purpose of this interactive presentation is to highlight injuries and clinical settings which may require expedited advanced imaging of the foot and ankle in addition to radiography while the patient is still in the emergency room.

RC708C Pelvis

Participants

Bharti Khurana, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the key factors that contribute to pelvic stability. 2) Recognize the patterns of osseous and soft-tissue injuries in pelvic fractures.

ABSTRACT

Treating trauma patients with displaced pelvic fractures requires a multidisciplinary approach at a designated trauma center to reduce morbidity and mortality. Immediate recognition of pelvic ring disruption and determination of pelvic stability are critical components in the evaluation of such patients. Stability is achieved by the ability of the osseoligamentous structures of the pelvis to withstand physiologic stresses without abnormal deformation. The supporting pelvic ligaments, including the posterior and anterior sacroiliac, iliolumbar, sacrospinous, and sacrotuberous ligaments, play a crucial role in pelvic stabilization. Radiologists should be familiar with the ligamentous anatomy and biomechanics relevant to understanding pelvic ring disruptions, as well as the Young and Burgess classification system, a systematic approach for interpreting pelvic ring disruptions and assessing stability on the basis of fundamental force vectors that create predictable patterns. This system provides an algorithmic approach to interpreting images and categorizes injuries as anteroposterior (AP) compression, lateral compression, vertical shear, or combined. Opening and closing of the pelvis from rotational forces result in AP compression and lateral compression injuries, respectively,

whereas vertical shear injuries result from cephalad displacement of the hemipelvis. AP and lateral compression fractures are divided into types 1, 2, and 3, with increasing degrees of severity. Knowledge of these injury patterns leads to prompt identification and diagnosis of other subtle injuries and associated complications at pelvic radiography and cross-sectional imaging, allowing the orthopedic surgeon to apply corrective forces for prompt pelvic stabilization

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Bharti Khurana, MD - 2014 Honored Educator

RC806

Head and Neck Emergency!

Friday, Dec. 4 8:30AM - 10:00AM Location: E450B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC806A Adult Non-Traumatic Emergencies

Participants

Karen L. Salzman, MD, Salt Lake City, UT, (karen.salzman@hsc.utah.edu) (*Presenter*) Consultant, Reed Elsevier; Stockholder, Reed Elsevier

LEARNING OBJECTIVES

1) Review imaging techniques of nontraumatic adult head and neck emergencies. 2) Recognize non-traumatic adult head and neck emergencies and diagnose the extent of disease and its complications.

RC806B Pediatric Non-Traumatic Head and Neck Emergencies

Participants

Caroline D. Robson, MBChB, Boston, MA (*Presenter*) Editor with royalties, Reed Elsevier; Author with royalties, Reed Elsevier;

LEARNING OBJECTIVES

1) Familiarize the audience with imaging protocols that should be used for assessing pediatric head and neck emergencies. 2) Recognize pediatric head and neck emergencies and effectively diagnose the extent of disease and its complications. 3) Provide reports that enable the referring clinician to effectively treat pediatric head and neck emergencies.

ABSTRACT

The talk will focus on pediatric airway obstruction. Please see attached pdf of the talk including two articles for reference regarding pediatric nasal lesions.

Abstract Handout: Caroline Diana Robson

<http://abstract.rsna.org/uploads/2015/15001963/RC806B Pediatric Non-Traumatic Head and Neck Emergencies.pdf>

RC806C Traumatic Head and Neck Emergencies

Participants

Lindell R. Gentry, MD, Madison, WI, (lgentry@uwhealth.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate the most common traumatic lesions that are encountered in the head and neck. 2) Discuss the important traumatic complications of the face, orbit, skull base, temporal bone, and blood vessels. 3) Discuss imaging strategies to effectively diagnose these traumatic lesions and their complications.

ABSTRACT

Traumatic injury of the head and neck is one of the most important and common diagnostic problems that radiologists will encounter in daily practice. Because of the vulnerability of important bony and soft tissue structures in this region, significant traumatic and potentially life-altering complications may be encountered with blunt and penetrating traumatic forces. Traumatic forces may cause injury of the bony and soft tissue structures of the orbit, including the globe, extraocular muscles, optic nerve, and 3rd-6th cranial nerves. This may result in ocular rupture, extraocular muscle entrapment, retrobulbar hemorrhage, proptosis, traumatic optic neuropathy, and superior orbital fissure syndrome. Diagnosis and management of these orbital injuries will be reviewed. Significant dental malocclusion or malunion may arise from displaced fractures of the mandible. Critical airway compromise may be caused by traumatic injury of the mandible, larynx, and trachea. Skull base and temporal bone trauma may produce a number of important complications that will be addressed in this lecture. These include conductive and sensorineural hearing loss, cerebrospinal fluid leak, traumatic facial palsy, lower cranial nerve injury, as well as cerebrovascular injury. Cerebrovascular injury is one of the most important and potentially life-altering complications that may be encountered with both blunt and penetrating craniocervical trauma. The vulnerable position of the extracranial and intracranial cerebral vasculature makes these vessels highly susceptible to traumatic injury. Fractures of the skull base or cervical spine may cause a variety of critically important traumatic lesions (dissection, pseudoaneurysm, occlusion, rupture, arteriovenous fistula). This lecture will discuss high risk imaging signs that suggest the possibility of cervical or intracranial cerebrovascular trauma. The rational for effective imaging workup and identification of these injuries will be emphasized.

RC808

Emergency Ultrasound Pitfalls (An Interactive Session)

Friday, Dec. 4 8:30AM - 10:00AM Location: E353C



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC808A Pitfalls in Right Upper Quadrant Ultrasound

Participants

Mindy M. Horrow, MD, Philadelphia, PA, (horrowm@einstein.edu) (*Presenter*) Spouse, Director, Merck & Co, Inc

LEARNING OBJECTIVES

1) Describe technical factors that may improve visualization of cholelithiasis including appropriate frequency transducer and identification of gallbladder neck. 2) Identify non biliary causes of gallbladder wall thickening. 3) Recognize causes for non-visualization of a fluid filled gallbladder and how to differentiate the gallbladder from other fluid filled structures in the right upper quadrant. 4) Describe situations in which color Doppler is essential to detect renal causes of right upper quadrant pain.

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Mindy M. Horrow, MD - 2013 Honored Educator

RC808B Pediatric Abdominal Ultrasound Pitfalls

Participants

Susan D. John, MD, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Use optimal protocols for performing abdominal US in infants and children. 2) Avoid diagnostic errors in pediatric gastrointestinal US caused by common artifacts and variables in exam performance. 3) Recognize variations in pathology and important secondary findings that are helpful for the diagnosis of acute or emergent conditions in the pediatric abdomen.

ABSTRACT

RC808C Non-obstetrical Gynecologic Ultrasound Pitfalls

Participants

Ana P. Lourenco, MD, Providence, RI, (alourenco@lifespan.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize commonly encountered gynecological ultrasound pitfalls. 2) Describe strategies to avoid these pitfalls.

ABSTRACT

This session will review common pitfalls encountered in gynecologic ultrasound and highlight strategies for avoiding such pitfalls. Case-based presentations will illustrate the varied presentations of ovarian torsion, non-gynecologic etiologies for acute pelvic pain including ureteral calculi and acute appendicitis, and a variety of uterine, ovarian and adnexal abnormalities. The benefits and limitations of transabdominal and transvaginal imaging, as well as color Doppler, will be highlighted with examples to demonstrate the utility of each technique.

Active Handout: Ana P. Lourenco

http://abstract.rsna.org/uploads/2015/15003351/Active_RC808C.pdf

RC808D First Trimester Ultrasound Pitfalls

Participants

Mariam Moshiri, MD, Seattle, WA (*Presenter*) Consultant, Reed Elsevier; Author, Reed Elsevier

LEARNING OBJECTIVES

1) To review the relatively recent report of the Society of Radiologists in Ultrasound, on new ultrasound criteria for evaluation of first trimester pregnancy. 2) To demonstrate potential pitfalls of sonographic performance and interpretation in the first trimester of pregnancy, and to discuss how to avoid them. 3) To review other relevant, very recent literature on first trimester pregnancy ultrasound performance and interpretation.

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Mariam Moshiri, MD - 2013 Honored Educator

Mariam Moshiri, MD - 2015 Honored Educator

RC812

Acute Abdominal Vascular Diseases (An Interactive Session)

Friday, Dec. 4 8:30AM - 10:00AM Location: E353B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC812A Aortic Branch Dissections

Participants

Dominik Fleischmann, MD, Palo Alto, CA (*Presenter*) Research support, Siemens AG;

LEARNING OBJECTIVES

1) Review the epidemiology of aortic side-branch dissections, which can occur as a complication of aortic dissection, or as isolated spontaneous dissections of the visceral or renal arteries. 2) Explain the pathophysiology of side branch malperfusion syndromes in aortic dissection. 3) Present the spectrum of imaging findings in spontaneous aortic branch dissections, including the differential diagnosis (vasculitis, connective tissue diseases, fibromuscular dysplasia, segmental arterial mediolysis).

ABSTRACT

Dissections of aortic side branches is a common complication of Type A and Type B acute aortic dissection which substantially increases mortality. It is important to understand the pathophysiology and the two principle mechanisms of side branch malperfusion in aortic dissection: flow obstruction can be due to (A) local abnormalities, such as occlusive dissection flaps, blind ending false lumen with true lumen occlusion ('windsock'), or frank thrombosis. Side-branch malperfusion may also occur due to (B) limited inflow: The classic situation is complete true lumen collapse in the upstream aorta, resulting in underperfusion of all downstream branches supplied by the true lumen. While local obstructions are most commonly treated by stent placement into the diseased side branch, inflow-lesions typically require surgical or endovascular repair of the upstream aorta. Spontaneous dissections of the celiac, mesenteric, or renal arteries are relatively rare events, and typically present with acute abdominal or flank pain. Dissections of side branch arteries can lead to ischemic complications or to frank rupture with intra- or retroperitoneal hemorrhage. Patients presenting with mesenteric or renal artery dissection require a thorough workup to identify genetic disorders (notably Ehlers Danlos IV), inflammatory conditions (vasculitis), and other entities such as fibromuscular dysplasia and segmental arterial mediolysis (SAM). Imaging findings range from non-obstructive lesions such as intramural hematoma, double-barrel lumen, to partial or complete obstruction ('windsock'). Complications include rupture or ischemia. Spontaneous dissections may heal, or evolve into aortic branch aneurysms.

RC812B Symptomatic Aneurysms

Participants

Phillip M. Young, MD, Rochester, MN, (young.phillip@mayo.edu) (*Presenter*) Nothing to Disclose

ABSTRACT

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture - most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan's and Ehlers-Danlos syndrome and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or iliofemoropopliteal artery aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT Angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the "symptomatic aneurysm" is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non invasive management with serial CT Angiographic imaging will be discussed.

RC812C Mesenteric Ischemia

Participants

Iain D. Kirkpatrick, MD, Winnipeg, MB, (kirkpatrick_iain@hotmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the various categories of mesenteric ischemia (arterial occlusive, embolic, venous thrombotic, and nonocclusive), and the pathophysiologic basis behind the imaging findings in each case. 2) Understand the basis behind modern CT protocols for mesenteric ischemia, particularly the biphasic examination with CT mesenteric angiography. 3) Demonstrate techniques to rapidly analyze a mesenteric CT angiographic dataset. 4) Review the CT signs of mesenteric ischemia and their sensitivity and specificity.

5) Evaluate the current literature on mesenteric ischemia and discuss optimal diagnostic criteria.

ABSTRACT

Acute mesenteric ischemia (AMI) is a life-threatening condition said to affect up to 1% of patients presenting with an acute abdomen, and it carries a mortality rate ranging between 59-93% in the published literature. Time to diagnosis and surgical treatment are the only factors which have been shown to improve mortality, and evidence shows that the clear test of choice for AMI is now biphasic CT. Water is preferably administered as a negative contrast agent, followed by CT mesenteric angiography and then a portal venous phase exam. Diagnostic accuracy is significantly improved by analysis of the CT angiogram for arterial stenoses or occlusions, evidence of emboli, or angiographic criteria of nonocclusive ischemia. It is the use of CT angiography in addition to routine portal phase imaging which has pushed the sensitivity and specificity of the test to >90% in recent published articles. Other nonangiographic CT findings that are relatively specific for AMI in the appropriate clinical setting include pneumatosis intestinalis, portal or mesenteric venous gas or thrombosis, and decreased bowel wall enhancement. Bowel wall thickening, mesenteric stranding, ascites, and mucosal hyperenhancement are more nonspecific findings which may also be seen. Nonocclusive ischemia may be the most difficult form to diagnose, and findings of shock abdomen can aid in identification. Knowledge of the patient's clinical history is critical not only for the selection of an appropriate study protocol but also for interpretation of the imaging findings in context.

RC812D Gastrointestinal Bleeding

Participants

Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the appropriate implementation of CT angiography in the evaluation of patients presenting with acute lower intestinal bleeding. 2) To describe the technical details that are necessary for acquiring good quality CT angiography examinations. 3) Illustrate the characteristic CT angiographic findings of active or recent bleeding with specific examples of multiple etiologies.

ABSTRACT

Acute gastrointestinal bleeding is a serious condition that may threaten a patient's life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectives of the diagnostic evaluation. Implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as the inability to precisely localize the source of bleeding and determine its cause. Properly performed and interpreted CT angiography examinations offer logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

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Jorge A. Soto, MD - 2013 Honored Educator

Jorge A. Soto, MD - 2014 Honored Educator

Jorge A. Soto, MD - 2015 Honored Educator

Friday Imaging Symposium: Neuroimaging Emergencies

Friday, Dec. 4 12:30PM - 3:00PM Location: E253CD



AMA PRA Category 1 Credits™: 2.50
ARRT Category A+ Credits: 3.00

Participants

Christopher P. Hess, MD, PhD, Mill Valley, CA, (christopher.hess@ucsf.edu) (*Moderator*) Research Grant, General Electric Company; Research Grant, Quest Diagnostics Incorporated; Research Grant, Cerebrotech Medical Systems, Inc;

Sub-Events

SPFR61A CNS Infection

Participants

Ashley H. Aiken, MD, Atlanta, GA, (ashley.aiken@emoryhealthcare.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize basic imaging patterns of CNS infection in the immunocompetent patient 2) Use imaging features of specific pathogens along with clinical characteristics to narrow the imaging differential diagnosis and guide treatment. 3) Recognize imaging features of opportunistic infections in the immunocompromised patient.

ABSTRACT

The radiologist plays a crucial role in identifying and narrowing the differential diagnosis of CNS infection. This case-based review aims to outline a practical imaging approach based on 5 basic imaging patterns: 1) Extra-axial infection 2) Ring-enhancing lesion 3) Temporal lobe lesion 4) Basal ganglia lesion 5) White matter abnormality. For extra-axial patterns of infection, it is key to search the paranasal sinuses, middle ear, and mastoid air cells for a source. It is also very important to look out for complications including brain abscess, dural sinus thrombosis, infarction, and hydrocephalus. The ring-enhancing pattern is the classic mimicker, and there is a long list of differential considerations. Frequently, the primary differential can be narrowed to infection versus neoplasm. However, close attention to the imaging features is critical to recognize non-operative ring-enhancing lesions such as tumefactive demyelination, subacute infarct, and subacute hematoma. The imaging characteristics that favor infection over neoplasm include a thin, smooth, ring-enhancement, "daughter cysts", a thinner ring of enhancement toward the ventricular surface and, of course, the "light bulb bright DWI" of a pyogenic abscess. When the temporal lobe imaging pattern is encountered, the primary diagnostic consideration should always be herpes encephalitis! Primary differential considerations for bilateral basal ganglia and white matter abnormalities include infection, toxic-metabolic etiologies, venous ischemia, hypoxic-ischemic injury and neoplasm. It is critical to know the patient's history and specifically their immune status. Within these broad imaging categories, a thorough understanding of the characteristic imaging features of specific pathogens and clinical history are essential to narrow the differential considerations and propose a more specific diagnosis. Neuroimaging also plays a pivotal role in diagnosing and monitoring the therapeutic response in opportunistic infections in the setting of HIV. This subset of infections will also be discussed within the context of the five basic imaging patterns listed above. References: 1) Aiken AH. Central Nervous System Infection. Neuroimaging Clin N Am. 2010 Nov; 20 (4): 557-80

URL

Handout: Ashley Hawk Aiken

<http://abstract.rsna.org/uploads/2015/15002667/CNSinfection.handout.RSNA.12.4.15.pptx>

SPFR61B Evaluation and Management of Acute Stroke

Participants

Achala S. Vagal, MD, Cincinnati, OH (*Presenter*) Research Grant, F. Hoffmann-La Roche Ltd;

LEARNING OBJECTIVES

1) To review the classic imaging features of acute ischemic stroke. 2) To review the role of imaging selection in evaluation and management of acute stroke. 3) To review stroke mimics.

ABSTRACT

The landscape of acute ischemic stroke treatment is rapidly changing with multiple positive endovascular trials. In the current scenario, neuroimaging plays a vital role in the diagnosis, triage and treatment of acute ischemic stroke patients. Comprehensive evaluation of brain parenchyma, vessel status and tissue perfusion is critical in patient selection. This case based course will highlight the practical aspects of acute ischemic stroke evaluation in the emergency setting.

URL

SPFR61C Intracranial Hemorrhage: Pearls and Pitfalls

Participants

Jalal B. Andre, MD, Seattle, WA, (drjalal@uw.edu) (*Presenter*) Research Grant, Koninklijke Philips NV; Consultant, Hobbitview, Inc; Research Grant, Toshiba Corporation;

LEARNING OBJECTIVES

1) Gain a deeper understanding of how etiology, location, and timing of intracranial hemorrhage may affect patient disposition and

1) Gain a deeper understanding of how etiology, location, and timing of intracranial hemorrhage may affect patient disposition and outcome, and review pertinent associated radiological findings. 2) Explore recent imaging methods that better characterize intracranial hemorrhage and its components. 3) Discuss current treatment strategies for managing intracranial hemorrhage that are relevant to radiologists.

ABSTRACT

Intracranial hemorrhage has been traditionally classified as intra- versus extra-axial in location, and can arise from a variety of etiologies. We will focus on the above learning objectives through a case-based exploration of intracranial hemorrhage and associated complications as they pertain to the following locations: 1) Intraventricular 2) Intraparenchymal 3) Subarachnoid 4) Subdural 5) Epidural

URL

SPFR61D Spine Emergencies

Participants

Jason F. Talbott, MD, PhD, San Francisco, CA, (jason.talbott@ucsf.edu) (*Presenter*) Data Safety Monitoring Board, StemCells, Inc

LEARNING OBJECTIVES

1) Gain familiarity with the subaxial injury classification system (SLIC) for cervical spine trauma and AOSpine thoracolumbar injury classification system (TLICS) for thoracolumbar spine trauma. 2) Review standardized nomenclature for vertebral fracture morphology descriptions utilized by both SLIC and TLICS. 3) Review a systematic checklist for spinal imaging findings in the setting of suspected non-traumatic spinal emergencies.

ABSTRACT

The radiologist plays a critical role in evaluation of spinal emergencies, both traumatic and nontraumatic. With respect to traumatic spine emergencies, the primary focus of this review is to familiarize the radiologist with the increasingly utilized classification systems employed by many spine surgeons for (1) subaxial cervical spine trauma known as subaxial injury classification (SLIC) and (2) thoracolumbar spine trauma known as thoracolumbar lumbar injury classification system (TLICS) and the more recently updated AOSpine TLICS. These grading schemes were designed by surgeons to aid in surgical decision-making and share in common some descriptive nomenclature related to vertebral body fracture morphology, discoligamentous complex integrity, and frank spine displacement/translation injury. It is important that the radiologist interpreting spinal trauma studies is familiar with these classifications schemes as they are increasingly supplanting older classification systems for surgical decision-making. Finally, a case-based review of non-traumatic spinal emergencies will be undertaken to emphasize a systematic checklist for imaging findings suggesting emergent pathology.

URL

SPFR61E Head and Neck Emergencies

Participants

Jenny K. Hoang, MBBS, Durham, NC, (jennykh@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe imaging findings of acute head and neck diseases that are emergencies. 2) Apply a systematic checklist to identify key imaging findings that could lead in significant morbidity or mortality.

ABSTRACT

This will be a case-based presentation of imaging findings of head and neck emergencies categorized into 4 clinical scenarios: 1. Fever 2. Trauma 3. Difficulty breathing 4. Epistaxis

URL