Chest Radiology

CH001-EB-X

How Do You Make Sure the Pulmonary Lesion is Calcified? Digital Tomosynthesis Can Help Your Diagnosis of Calcified Pulmonary Lesions for No Further Work-up

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Ji Yung Choo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ki Yeol Lee, MD, PhD, Ansan , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun Sil Kim, Ansan-Si, Korea, Republic Of (*Presenter*) Nothing to Disclose
Eun-Young Kang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yu-Whan Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To understand the technical concept of low dose digital tomosynthesis of the chest and its implementation
2. To understand which type of calcified lesion can be evaluated under digital tomosynthesis
3. To recognize the limitations and benefits of digital tomosynthesis of the chest in radiation exposure and image acquisition

TABLE OF CONTENTS/OUTLINE

Our exhibit will be divided into 6 sections and presented with illustration and relevant cases regarding usefulness of tomosynthesis in evaluation of calcified and non-calcified pulmonary lesions: 1. Background and physics of digital tomosynthesis of the chest 2. Comparison of calcified and non-calcified thoracic lesion 1) Calcified vs non-calcifie nodules 2) Calcified pleural lesion 3) Vascular calcification 4) Airway calcification 5) Other high contrast pulmonary lesions3. Detectable calcification on CXR and DTS - Density (Hounsfield unit), size, location4. Needs of follow-up or further work-up5. Other high contrast pulmonary lesions6. Benefits and limitation of tomosynthesis of the chest 1) Radiation exposure 2) Image acquisition 3) Image quality

CH002-EB-X

Comprehensive Review of Congenital Proximal Interruption of the Pulmonary Arteries

All Day Room: CH Community, Learning Center

Participants

Chad Cox, MD , Riverview, FL (*Presenter*) Nothing to Disclose
Jonathan H. Chung, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
John Donatelli, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
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Jonathan M. Ford, PhD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Carlos Andres Rojas, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Learn the embryological development of the pulmonary arterial system.2. Understand the clinical presentation, implications, and associations of proximal pulmonary arterial interruption.3. Be able to recognize the key radiologic findings that occur in the setting of proximal pulmonary arterial interruption. 4. Be able to list the differential diagnosis and distinguishing imaging features between proximal interruption of pulmonary arteries and other mimics that impair pulmonary arterial blood supply.

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1. Embryological development of pulmonary arteries.2. A complete review of congenital pulmonary arterial interruption including etiology, demographics, inheritance patterns, clinical history and presentation, treatment, differential considerations, and prognosis.3. Comprehensive review of imaging findings through ten different cases of proximal interruption of the pulmonary arteries. This will be thoroughly demonstrated using multiple different imaging modalities including chest radiograph, ventilation/perfusion imaging, CT, CTA, MRA, and conventional angiography. 4. Discussion of acquired etiologies of proximal arterial interruption with a review of key radiologic findings in multiple cases including pulmonary artery sarcoma and fibrosing mediastinitis.

Honored Educators

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Jonathan H. Chung, MD - 2013 Honored Educator

CH003-EB-X

Parametric Response Mapping-Clinical Applications of a Novel Imaging Biomarker in Pulmonary Disease

All Day Room: CH Community, Learning Center

Participants

Dharshan R. Vummidi, MRCP, FRCR, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Craig J. Galban, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Meilan K. Han, Ann Arbor, MI (*Abstract Co-Author*) Consultant, Boehringer Ingelheim GmbH; Consultant, GlaxoSmithKline plc; Consultant, Novartis AG; Consultant, AstraZeneca PLC; Royalties, UpToDate, Inc
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Vibha Lama, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Ella A. Kazerooni, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Parametric response mapping is a novel imaging biomarker that allows for the accurate characterization and quantification of the COPD spectrum and more recently bronchiolitis obliterans syndrome in stem cell and lung transplantation.

TABLE OF CONTENTS/OUTLINE

Parametric response mapping (PRM) is a quantitative imaging biomarker used for the assessment of obstructive lung disease. It is a post processing technique consisting of linking inspiratory and expiratory CT lung scans to provide a classification of individual voxels of lung parenchyma as normal, functional small airways disease (fSAD), and emphysema.Current clinical and imaging biomarkers cannot accurately phenotype chronic obstructive pulmonary disease (COPD) into airway predominant, parenchymal predominant or mixed. PRM allows for characterization and quantification of obstructive pulmonary disease from any volumetric inspiratory/expiratory HRCT acquisition without any additional radiation exposure.On the provided color maps, green - normal lung, yellow - functional small airways disease, red - emphysema.Emerging applications of PRM are in recognizing bronchiolitis obliterans syndrome (BOS) in the context of hematopoietic stem cell transplant (HSCT) and lung transplantation earlier than afforded by the current clinical criteria and thereby influencing management.

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Ella A. Kazerooni, MD - 2014 Honored Educator

CH004-EB-X

The Imaging Spectrum and Longitudinal Changes of Pulmonary Artery Sarcoma (PAS) Masquerading Pulmonary Thromboembolism (PTE): The Multimodality Imaging Access

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Cherry Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Mi Young Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joon-Won Kang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To update the specific signs and imaging spectrum of PAS in multimodal imaging including CT, MR and PET-CT, and to show the correlated gross pathologic specimens. To demonstrate the early imaging findings of PAS causing delayed diagnosis, and its longitudinal changes in the imaging including final outcome after treatment. To review and suggest the diagnostic tips of PAS in the imaging.

TABLE OF CONTENTS/OUTLINE

1. The specific signs and imaging spectrum of PAS in CT, MR and PET-CT and the correlation with the gross pathology findings
1)Wall elipse sign
2)The pattern of tumor extension
3)Tumor heterogeneity with enhancement pattern
4)Nodularity and lobulation of the tumor (inner & outer wall undulation)
5)The adventitial enhancement of PA
6)The angle between PA wall and the tumor
7)Multiplicity or intravascular metastasis
8)Tumor vessel sign
9)Ancillary finding of lungs
10)Maximum standardized uptake value of fluorine 18-FDG
2. PAS masquerading PTE, causing delayed diagnosis: the early findings and its longitudinal changes
1)The early findings, mimicking PTE
2)Longitudinal change on follow up on imaging including final outcome after the latest treatment.
3. When the radiologists need to consider PAS preferentially than PTE?
- We suggest diagnostic criteria, taking into account of clinical and radiologic manifestations for early recognition.

CH006-EB-X

Dual Energy CT (DECT) of the Chest: Salient Contributions beyond the Lungs

All Day Room: CH Community, Learning Center

Participants

Alexi Otrakji, MD, Boston, MA (*Presenter*) Nothing to Disclose
Subba R. Digumarthy, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Shaunagh McDermott, FFR(RCSI), Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Efren J. Flores, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (*Abstract Co-Author*) Technical support, Siemens AG; Technical support, Medical Vision
Jo-Anne O. Shepard, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Rodrigo Canellas, MD, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

DECT is being increasingly applied for evaluation of thoracic abnormalities beyond pulmonary vasculature. Ancillary nonpulmonary findings can often be seen on different image types generated from DECT datasets including virtual monoenergetic and material decomposition (virtual non-contrast (VNC) and iodine (water subtracted)) images. VNC images can help differentiate between vascular and calcified lesions in the mediastinun and chest wall. Iodine distribution and iodine concentration (mg/cc) help assess the vascularity of the lesions on iodine images. The purpose of this exhibit is to highlight appearance of non-pulmonary ancillary lesions in 15000+ DECT examinations of the chest performed in the past three years at our institution.

TABLE OF CONTENTS/OUTLINE

The exhibit employs a case based format to display appearance of various non-pulmonary ancillary findings seen on DECT of the chest including: Cardiac abnormalities on chest DECT: thrombus, pericardial abnormalities, cardiac calcification. Mediastinal abnormalities: Mediastinal lesions including thymic lesions and lymph nodes Thyroid abnormalities: Calcifications, nodules Pleural abnormalities: Pleural nodules versus talc pleurodesis, empyema Chest wall abnormalities: including tumors, abscess, psudoaneurysm Cutaneous lesions: Melanoma metastases and cysts Breast implants and lesions

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Subba R. Digumarthy, MD - 2013 Honored Educator

CH007-EB-X

Endobronchial Lesions: Detection, Causes and Management

All Day Room: CH Community, Learning Center

Awards
Identified for RadioGraphics

Participants
Marie-Michele Theriault, MD, Sherbrooke, QC (*Presenter*) Nothing to Disclose
Joy N. Borgaonkar, MD, FRCPC, Halifax, NS (*Abstract Co-Author*) Nothing to Disclose
Judith L. Babar, MBChB, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Robert M. Miller, MD, Halifax, NS (*Abstract Co-Author*) Nothing to Disclose
Daria Manos, MD, FRCPC, Halifax, NS (*Abstract Co-Author*) Speakers Bureau, F. Hoffmann-La Roche Ltd

TEACHING POINTS

The bronchial tree can be challenging to evaluate with CT; small endobronchial lesions can be easily missed and diffuse wall thickening may be easily overlooked. An isolated mucus plug or a persisting small band of atelectasis may be the first manifestation of an endobronchial malignancy. Several other ancillary CT findings, including the double artery sign, the finger-in-glove sign and post-obstructive bronchiectasis, may improve detection of endobronchial lesions. The differential diagnosis of central bronchial tree lesions include focal abnormalities such as debris and tumors, as well as diffuse abnormalities, which usually result from inflammatory, infectious or infiltrative processes.

TABLE OF CONTENTS/OUTLINE

Anatomy and function of the bronchial tree. Pitfalls in the diagnosis of early endobronchial lesions. Review of ancillary CT signs that may improve detection and characterization of endobronchial lesions. Pattern-based approach to the differential diagnosis of endobronchial lesion with case examples. Appropriate management of endobronchial abnormalities.

CH008-EB-X

When Chest CT Falls Short, Thoracic MR Stands Tall

All Day Room: CH Community, Learning Center

Participants
Dania Daye, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Melissa Price, MD, 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
Jeanne B. Ackman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

When lesions on chest CT are indeterminate, MR can serve a complementary role. Its higher soft tissue contrast can more definitively characterize tissue, often yielding a more specific diagnosis. Despite the advantages thoracic MR offers, it remains underutilized. The aims of this exhibit are to: Define the limitations of chest CT and review the advantages of thoracic MRI in the characterization of mediastinal, pleural, and pulmonary lesions Illustrate, using a case-based approach, different scenarios in which thoracic MRI can be instrumental in making a specific diagnosis.

TABLE OF CONTENTS/OUTLINE

Illustrative cases will be presented in quiz format to demonstrate how MR can supplement incomplete information provided by CT regarding thoracic lesions, narrowing the differential diagnosis and changing clinical management. For each case, CT and MR images will be provided, followed by a differential diagnosis and a final pathologic diagnosis, when applicable. The list of cases will include: Thymic Cyst Thymic Hyperplasia Foregut Duplication Cyst Mediastinal Hemangioma Esophageal Leiomyoma Chronic Mediastinal Fibrosis Mesothelioma Solitary Fibrous Tumor of the Pleura Pulmonary Hamartoma Pulmonary Hematoma or Abscess

CH009-EB-X

What's Up There? Differential Diagnosis of Apical Tumors in the Thoracic Cavity, Beyond Pancoast Tumor

All Day Room: CH Community, Learning Center

Participants
Philip C. Louden, MD, Charlottesville, VA (*Presenter*) Nothing to Disclose
Lucia Flors, MD, Charlottesville, VA (*Abstract Co-Author*) Nothing to Disclose
Juliana M. Bueno, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The anatomy of the thoracic inlet is complex. Multiple structures localized in the thoracic inlet may give rise to various lesions that manifest as apical tumors. Lesions in this location may originate from the pulmonary superior sulcus or adjacent vascular, neural, osseous and muscular structures. Moreover, lesions from midline structures in the thoracic inlet, such as the thyroid, can extend laterally and manifest as apical tumors. The primary lung cancer that presents in this location is known as Pancoast tumor. Other entities may present in this region although characteristic imaging findings allow differentiation. After reviewing this exhibit the learner will be able to: Identify the anatomic compartments of the thoracic inlet. List the spectrum of lesions localized in the thoracic inlet and their various origins, which include: peripheral nerve sheath tumors, desmoid tumor, thoracic duct cyst, aneurysms of the supraaortic branches, extrapleural lipoma, plasmocytoma and thyroid lesions. Recognize the role of cross sectional imaging (CT and MRI) in the characterization of lesions in this location. Identify unique imaging characteristics that allow differentiation.

TABLE OF CONTENTS/OUTLINE

Anatomy of the thoracic inlet (superior sulcus) Case-based review of common lesions in this location and their imaging characteristics Conclusions

CH010-EB-X

Imaging of the Cardiothoracic Manifestations of Vasculitis: Pearls and Pitfalls

All Day Room: CH Community, Learning Center

Participants
Zeeshaan S. Bhatti, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Dharshan R. Vummidi, MRCP, FRCR, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Ora Singer, MD, MS, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1.) To review the revised Chapel Hill Consensus classification of vasculitis. 2.) To discuss the clinical and imaging manifestation of the most common vasculitides, with emphasis on cardiothoracic involvement.3.) To highlight pearls and pitfalls in the radiologic diagnosis of vasculitides with illustrative examples.4.) To propose a diagnostic algorithm, integrating imaging features with clinical history, laboratory data, and histopathology.

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1.) Chapel Hill Classification of Vasculitis: Large vessel Medium vessel Small vessel2.) Large Vessel Vasculitis: Takayasu's disease Giant cell arteritis3.) Medium Vessel Vasculitis: Polyarteritis nodosa Behcet's disease4.) Small Vessel Vasulitis: Granulomatous polyangitis Eosinophilic granulomatous polyangitis Microscopic polyangitis5.) Pitfalls: Vasculitis mimickers6.) Diagnostic Algorithm

CH011-EB-X

Role of CT on Bronchoscopic Treatment of COPD

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Danilo O. Carvalho, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Gustavo B. Teles, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Hamilton Shoji, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Gilberto Szarf, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Rodrigo C. Chate, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcelo B. Funari, MD, Ribeirao Pires, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to:- Review the clinical indications for bronchoscopic lung volume reduction using endobronchial valves- Highlight the role of CT in endobronchial treatment of chronic obstructive pulmonary disease (COPD)- Discuss how quantitative CT can be used to assess emphysema severity, heterogeneity and fissure completeness- Understand the use of CT in planning the procedure and follow up after endobronchial valve placement

TABLE OF CONTENTS/OUTLINE

Background of lung volume reduction using a one-way endobronchial valve as a safe and effective alternative for some severe emphysema patientsA pictorial essay through sample images will allow a review of:- Clinical indications for endobronchial treatment of COPD- Selecting patients for bronchoscopic lung volume reduction- CT assessment of emphysema severity, heterogeneity and fissure completeness- Planning the procedure and- Follow up after intervention

CH100-ED-X

New Kids on the Block: Contemporary Review of Monitoring and Therapeutic Devices in the Chest

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
Daniel Vargas, MD, Denver, CO (*Presenter*) Nothing to Disclose
Thomas D. Suby-Long, MD, Highlands Ranch, CO (*Abstract Co-Author*) Nothing to Disclose
Nicole L. Restauri, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Daniel Ocazionez, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Tami J. Bang, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Peter B. Sachs, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Familiarize the radiologist with the arsenal of newer medical devices in the chest. Describe the appropriate positioning, indications and imaging appearance of such devices.

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Left Ventricular Assist Devices (Heartmate II, Heartmate III, Heartware, Impella)Mitral ClipsAtrial Appendage ClipWatchman deviceCardioMEMS deviceHeartNetTranscatheter Valves (aortic, mitral, Melody)Intracardiac Leadless PacemakerSeptal Occluding Devices and Perivalvular Leak PlugsEsophageal Doppler probeEkos CatheterEndobronchial ValvesSilicone Tracheal Stent

Honored Educators

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator

CH101-ED-X

A Practical Approach to Lung Cancer Screening: Implementing and Maintaining a Lung Cancer Screening Center

All Day Room: CH Community, Learning Center

Participants

Michael B. Shvarts, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Paul A. DiCamillo, MD, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Luis A. Landeras, MD, Cleveland, OH (*Abstract Co-Author*) Institutional Grant support, Koninklijke Philips NV

TEACHING POINTS

To understand the relationship between physician, facility, and technical requirements for starting and maintaining a lung cancer screening center To review the criteria needed for reimbursement for participating in a lung cancer screening center To review the Lung-RADS assessment terminology and categories

TABLE OF CONTENTS/OUTLINE

1) Introduction
2) Criteria to implement a lung cancer screening(LCS) program
3) Starting the program and receiving reimbursement under CMS guidelines
   -Professional, facility and technical requirements
   -Patient eligibility and counselling
4) Review of ACR Lung-RADS lexicon and recommendations with visual examples
   -ACR Lung RADS Version 1.0
   -Solid, part solid and ground glass nodules
   -Qualifiers(C,S,X)
5) Receiving ACR Accreditation

CH102-ED-X

Thoracic Complications of Precision Cancer Therapies: A Practical Guide for Radiologists in the New Era of Cancer Care

All Day Room: CH Community, Learning Center

Awards
Cum Laude
Identified for RadioGraphics

Participants
Mizuki Nishino, MD, MPH, Boston, MA (*Presenter*) Consultant, Bristol-Myers Squibb Company; Institutional Research Grant, Canon Inc; Institutional Research Grant, Merck & Co, Inc
Hiroto Hatabu, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, AZE, Ltd; Research Grant, Canon Inc; Research Grant, Konica Minolta Group
Nikhil H. Ramaiya, MD, Jamaica Plain, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Recent advances in understanding of molecular mechanisms of cancer development and progression have opened a new era of precision medicine approaches in cancer treatment. Acting by targeting specific molecules, precision cancer therapies are associated with a variety of thoracic complications, which is often unique to agents or groups of agents. Knowledge of the radiologic manifestations of these thoracic complications in specific cancer therapies is essential for radiologists. The purpose of this exhibit is provide a comprehensive review of thoracic complications of precision cancer therapies and discuss their mechanism of action. The exihibit is designed to serve as a practical reference guide for day-to-day practice in the chest reading room.

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Pneumonitis: mTOR inhibitors (everolimus, tesilorimus), EGFR inhibitors (erlotinib, gefitinib, afatinib, osimertinib), PD-1 inhibitors (nivolumab, pembrolizumab), Her-2 inhibitors (Trastuzumab), CD20 antibody (Rituximab); **Pulmonary hemorrhage:** VEGF inhibitors (bevacizumab); **Sarcoid-like lymphadenopathy:** CTLA-4 inhibitor (ipilimumab), PD-1 inhibitors (nivolumab, pembrolizumab); **Pleural edema and effusion:** Tyrosine kinase inhibitors (dasatinib, imatinib); **Pulmonary embolism:** VEGF inhibitors (bevacizumab, sorafinit, sunitinib); **Cardiomyopathy:** Her-2 inhibitors (Trastuzumab), PD-1 inhibitors

CH103-ED-X

Proposed Revisions to the TNM Staging System (TNM-8) for Lung Cancer: Rationale, Significance, and Clinical Application

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
Brett W. Carter, MD, Houston, TX (*Presenter*) Editor, Reed Elsevier;
John P. Lichtenberger III, MD, Bethesda, MD (*Abstract Co-Author*) Author, Reed Elsevier
Marcelo K. Benveniste, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Carol C. Wu, MD, Houston, TX (*Abstract Co-Author*) Author, Reed Elsevier
Patricia M. de Groot, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. The International Association for the Study of Lung Cancer (IASLC) has proposed revisions to the 8th edition of the TNM staging system based on the analysis of a retrospective lung cancer database consisting of cases collected from 1999 to 2012.2. Modifications have been made to the tumor (T) and metastasis (M) descriptors based on significant differences in patient survival with various feature characteristics. 3. Key changes to the T descriptors include further alterations based on tumor size, the grouping of all lesions involving the airways regardless of distance from the carina, the grouping of partial and complete lung atelectasis/pneumonitis, and the reclassification of diaphragmatic invasion.4. Key changes to the M descriptor include alterations based on the location of metastasis and the number of lesions affecting specific organs.

TABLE OF CONTENTS/OUTLINE

1. Discuss the rationale for proposed revisions to TNM-8.2. Illustrate TNM descriptors with examples on CT, MRI, and PET/CT, and synthesize combinations of descriptors into revised stage groupings. 3. Demonstrate the impact of TNM-8 on the management of patients with lung cancer.4. Outline recommendations issued by IASLC for the measurement of part-solid lesions, staging of lung cancers manifesting as consolidation, and staging and management of multiple pulmonary lesions.

Honored Educators

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Brett W. Carter, MD - 2015 Honored Educator
Mylene T. Truong, MD - 2015 Honored Educator

CH104-ED-X

This versus That: Chest Radiograph Diagnoses that Medical Students and Junior Residents Find Confusing

All Day Room: CH Community, Learning Center

Participants
Rebecca Schickman, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Daniel Strauchler, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Mark Guelfguat, DO, Clifton, NJ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Chest radiographs are the most commonly performed radiology examinations. Learning how to interpret common acute thoracic findings is an important skill for both radiology and non-radiology trainees.
This exhibit is based on preliminary data obtained during a randomized study sponsored by an RSNA grant. Medial students answered a series of multiple choice questions on chest radiographs. The students' responses and feedback served as the bases of this exhibit.
The purpose of this presentation is to clarify frequent misconceptions seen among the medical students, which evolve into knowledge gaps of radiology and clinical residents. The topics include:
Atelectasis
Pneumonia
Pneumomediastinum
Pneumopericardium
Tension pneumothorax
Congestive heart failure

TABLE OF CONTENTS/OUTLINE

1.Pulmonary volume loss vs. alveolar consolidation: findings and comparison between pneumonia and atelectasis of different lobes.
2.Pleural vs. pulmonary parenchymal processes: unique findings of pleural effusions, which are often confused with lower lobe pulmonary processes.
3.Mediastinal lucencies: findings and comparison between pneumomediastinum and pneumopericardium.
4.Emergent vs. urgent pleural findings: comparison of pneumothorax and tension pneumothorax.
5.Findings of different stages of congestive heart failure.

CH105-ED-X

What's in a Vein? Comprehensive Cross-sectional Imaging of the Pulmonaryvenous System

All Day Room: CH Community, Learning Center

Awards
Magna Cum Laude
Identified for RadioGraphics

Participants
Cameron Hassani, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Alison Wilcox, MD, Los Angeles, CA (*Abstract Co-Author*) Speaker, Toshiba Corporation
Rishi Agrawal, MD, Chicago, IL (*Abstract Co-Author*) Speakers Bureau, Boehringer Ingelheim GmbH
Gerald F. Greil, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Bonnie Garon, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Farhood Saremi, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: Review the relevant anatomy of the pulmonary venous system Review characteristic imaging findings of common and uncommon diseases involving the pulmonary venous system (PVS)

TABLE OF CONTENTS/OUTLINE

Normal anatomy of the pulmonary venous system Development Imaging characteristics of normal pulmonary veins in the adult on axial and MPR imaging Relationship to the normal adjacent pathways Normal anatomy after lung transplant Normal anatomy after cardiac transplantVariant anatomy of the PVS Varix Abnormal drainage (PAPVR/TAPVR) Common trunks (including meandering pulmonary veins) Arteriovenous malformationAbnormalities of the PVS Stenosis / Occlusion Post transplant Post pulmonary vein radiofrequency ablation Post surgical / iatrogenic injury Tumor invasion Tumor thrombosis Incl Trousseau's syndrome Pulmonary veno-occlusive disease (PVOD) Treatment Heart failure Trauma Torsion

Honored Educators

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Farhood Saremi, MD - 2015 Honored Educator

CH106-ED-X

Imaging Assessment of Intrathoracic Fatty Abnormalities: An Anatomic Approach

All Day Room: CH Community, Learning Center

Participants

Christopher McAdams, MD, Winston Salem, NC (*Presenter*) Nothing to Disclose
Evelyn Y. Anthony, MD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose
Hollins P. Clark, MD, Winston Salem, NC (*Abstract Co-Author*) Research Consultant, Galil Medical Ltd
J. Michael Holbert, MD, Greensboro, NC (*Abstract Co-Author*) Author, Reed Elsevier

TEACHING POINTS

1. Diagnose some fat-containing intrathoracic lesions based on their unique locations and appearances2. Discuss an appropriate differential diagnosis for a fat-containing intrathoracic lesion given patient age, lesion localization, temporal behavior, and associated characteristics3. Differentiate common and uncommon fat-containing intrathoracic lesions using case examples for each anatomic region, including a balanced selection of pediatric fat-containing pathologies

TABLE OF CONTENTS/OUTLINE

I. IntroductionII. Lesion Imaging Work-UpIII. Location-Driven Differential DiagnosisIV. Fat-containing Intrathoracic Lesions (presented by anatomic region)a. Pulmonary parenchymal/endobronchial lesions (e.g., hamartoma, lipoid pneumonia, lipogranulomatosis)b. Mediastinal lesions (e.g., teratoma, thymolipoma, mediastinal liposarcoma, extramedullary hematopoiesis)c. Cardiovascular lesions (e.g., lipomatous hypertrophy of the interatrial septum, caval pseudolipoma, arrhythmogenic right ventricular dysplasia)d. Diaphragmatic lesions (e.g., acquired/congenital hernias)e. Pleural lesions (e.g., pleural fat, pleural lipoma)f. Other lesions (e.g., lipoblastoma, mesenchymal hamartoma)

CH107-ED-X

Pulmonary Function Test 101 for Radiologist and Correlation with Quantitative Imaging

All Day Room: CH Community, Learning Center

Participants
Hyung Won Choi, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Kathleen Ruchalski, MD, Santa Monica, CA (*Abstract Co-Author*) Nothing to Disclose
Jonathan G. Goldin, MBChB, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Alexander Zider, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Fereidoun G. Abtin, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Chest CT imaging is used to reach a diagnosis or monitor disease progression when pulmonary function test (PFT) results are abnormal, have worsened, or do not explain clinical symptoms. Deeper understanding of PFT not only helps radiologists better identify abnormalities and assess disease severity, it also helps with understanding how quantitative imaging can serve as a noninvasive alternative or adjunct to PFT. After reviewing this presentation, participants will be able to:1. Understand what constitutes a PFT and their significance.2. Describe PFT patterns for common lung diseases.3. Understand how PFT translates to quantitative imaging. 4. Understand the limitations of PFT where chest CT and quantitative imaging bring added value.

TABLE OF CONTENTS/OUTLINE

1. Normal PFT measurements: Volume, Spirometry, Flow volume curves;2. Common PFT patterns and imaging correlates: A. Obstructive pattern (COPD, asthma, constrictive bronchiolitis).B. Restrictive pattern (IPF);3. Measurements of quantitative imaging: A. Indices of COPD- airway abnormality/morphology (airway measurements), air trapping (lung attenuation).B. Indices of IPF - skewness, kurtosis, visual scores of fibrosis;4. Correlation between PFT and quantitative imaging.

CH108-ED-X

Hemoptysis Originating from Bronchial and Non-bronchial Systemic Arteries, Pulmonary Arteries and Aorta: A Pictorial Review

All Day Room: CH Community, Learning Center

Participants
Hideyuki Torikai, Kawasaki, Japan (*Presenter*) Nothing to Disclose
Ichiro Hasegawa, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Hemoptysis is the symptom resulting from airway hemorrhage. Massive hemoptysis is rare condition, however the mortality is high if untreated appropriately. Pulmonary circulation consists of pulmonary and systemic arteries and pulmonary parenchyma adjoins some great vessels. Therefore, a variety of vascular lesions lead to hemoptysis and detection of the causes is essential for selecting the appropriate treatment to achieve hemostasis. The purpose of this exhibit is: 1. To review various pathophysiologic causes of hemoptysis comprehensively 2. To evaluate the affected vascular findings associated with hemoptysis on CTA3. To describe and illustrate CTA findings of the various causes of hemoptysis

TABLE OF CONTENTS/OUTLINE

1. Introduction2. Definition and Clinical Features of Hemoptysis3. The Affected Vascular Findings on CTAa. Extravasation of Contrast Media b. Aneurysm and Pseudoaneurysmc. Systemic to Pulmonary Circulation Shunting4. Differential Diagnosis and CTA Findings of the Causes of Hemoptysisa. Bleeding from Bronchial and Non-bronchial Systemic Arteriesb. Bleeding from Pulmonary Arteryc. Bleeding from Aorta

CH109-ED-X

A Pictorial Essay of the Diseased Trachea: Centrally Located, but Often Peripherally Considered

All Day Room: CH Community, Learning Center

Participants
Matthew Pagni, MD, Winston-Salem, NC (*Presenter*) Nothing to Disclose
Carl R. Fuhrman, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
J. Michael Holbert, MD, Greensboro, NC (*Abstract Co-Author*) Author, Reed Elsevier

TEACHING POINTS

Identify and characterize tracheal wall abnormalities based on their extent and involved components. Suggest a differential diagnosis for tracheal abnormalities based on imaging features, including extent, components involved, and changes in tracheal diameter. Focus on key differentiating features of disease processes that result in tracheal narrowing.

TABLE OF CONTENTS/OUTLINE

Background The trachea is routinely evaluated on cross-sectional CT imaging of the chest. Awareness of tracheal pathology can prevent missed and delayed diagnosis of tracheal pathology. Clinical Presentation Asymptomatic Dyspnea Chest pain Dysphagia Infection Approach Imaging technique Clinical history Imaging features Differential diagnosis Case Examples Tracheal narrowing Focal - post-intubation, post-infection, lipoma, papillomatosis, adenocarcinoma, metastatic disease Diffuse - saber-sheath trachea, tracheomalacia, relapsing polychondritis, tracheopathia osteoplastica, granulomatosis with polyangiitis, amyloidosis, inflammatory bowel disease Tracheal Dilation - tracheobronchomegaly (Mounier-Kuhn), traction fibrosis Conclusion

CH110-ED-X

Optimal Preoperative Artery-Vein Separation in 3D Computed Tomography-Angiography (CTA) Images for Simulation of the Pulmonary Arterial and Venous Circulation for Video-Assisted Thoracic Surgery in Patients with Pulmonary Cancer

All Day Room: CH Community, Learning Center

Participants

Jun Nakane, Kawagoe, Japan (*Presenter*) Nothing to Disclose
Yoshiharu Kobayashi, Kawagoe, Japan (*Abstract Co-Author*) Nothing to Disclose
Tsutomu Shiozawa, Kawagoe, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshiki Kurihara, Kawagoe, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroki Matsuzawa, Kawagoe, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Acquire CTA of the pulmonary arteries and pulmonary veins with contrast media volume of 30 mL. Determine the proper timing for scanning during inspiration using a test bolus. Construct the images of artery-vein separation using the basic function of the workstation within approximately 30 minutes.

TABLE OF CONTENTS/OUTLINE

For video-assisted thoracic surgery in patients with pulmonary cancer, it has been reported as important to understand the anatomical position of the pulmonary arteries and pulmonary veins. By acquiring images during inspiration using a test bolus, the timing for scanning of pulmonary arterial and venous phases can be determined accurately. Its usefulness has been verified in a prospective study as a high correlation in the CT numbers between the pulmonary arteries and pulmonary veins which were obtained using test bolus and main bolus was confirmed (pulmonary arteries, R = 0.798; pulmonary veins, R = 0.785). In addition, when image operation and thresholding rather than a software for the workstation are used for these images, 3D images of separated arteries and veins can be obtained in a short time.

CH111-ED-X

Diagnostic Imaging and Minimally Invasive Interventional Procedures in Adult Patients with Complications after Lung Transplantation

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants

Settimo Caruso, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose
Ambra di Piazza, MD, Palermo, Italy (*Presenter*) Nothing to Disclose
Roberto Miraglia, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Maruzzelli, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose
Gianluca Marrone, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose
Patrizio Vitulo, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Alessandro Bertani, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose
Angelo Luca, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To describe imaging findings (conventional radiology and MDCT) of common and uncommon complications following lung transplantation with emphasis on clinical signs and time of onset. To describe minimally invasive interventional procedures performed in recipients with complications after lung transplantation.

TABLE OF CONTENTS/OUTLINE

Surgical technique in lung transplantation. MDCT study protocol in lung transplant recipients. Imaging findings of immediate complications, early complications, intermediate complications secondary late complications, and correlation with with clinical functional parameters and histological findings in representative cases. Representative cases of minimally invasive interventional procedures in lung transplant recipients (bronchoscopic dilation and/or stent placement in bronchial stenosis with or without endobronchial debridement; radiology-assisted balloon dilation and/or stent placement in bronchial stenosis after failure of the standard bronchoscopic approach; combined percutaneous (CT-guided) and bronchoscopic approach for the treatment of airway occlusive stenosis after endobronchial debridement failure; radiology-assisted endobronchial lung abscesses drainage after failure of standard endobronchial drainage; endovascular embolization in recipients with massive hemoptysis).

CH112-ED-X

Dynamic Chest Radiography Using Flat Panel Detector System: Technique and Applications

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Magna Cum Laude

Participants
Yoshitake Yamada, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Masako Ueyama, MD, PhD, Kiyose, Japan (*Abstract Co-Author*) Nothing to Disclose
Takehiko Abe, MD, Kiyose, Japan (*Abstract Co-Author*) Nothing to Disclose
Tetsuro Araki, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hiroto Hatabu, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, AZE, Ltd; Research Grant, Canon Inc; Research Grant, Konica Minolta Group
Shoji Kudoh, MD, PhD, Kiyose, Japan (*Abstract Co-Author*) Nothing to Disclose
Masahiro Jinzaki, MD, Tokyo, Japan (*Abstract Co-Author*) Support, Toshiba Corporation Support, General Electric Company
Mizuki Nishino, MD, MPH, Boston, MA (*Abstract Co-Author*) Consultant, Bristol-Myers Squibb Company; Institutional Research Grant, Canon Inc; Institutional Research Grant, Merck & Co, Inc

TEACHING POINTS

To describe principles and analytic methods of dynamic chest radiography using flat panel detector (FPD) system. To illustrate clinical applications and advantages of the modality with clinical case presentations. To correlate imaging findings of dynamic chest radiography with those of conventional radiography, CT, and ventilation/perfusion scintigraphy.

TABLE OF CONTENTS/OUTLINE

Basic principles of dynamic chest radiography using FPD system: this modality provides sequential chest radiographs during respiratory effort with high temporal resolution (7.5-30 frames/s) with relatively low-cost, low radiation dose and easier accessibility. Radiation dose: entrance surface dose is 0.3-1.0 mGy for 15 s examination. Evaluation of diaphragm movement in the physiological standing position Ventilation weighted images derived from dynamic chest radiography: correlation with CT and ventilation scintigraphy images Perfusion weighted images derived from dynamic chest radiography: correlation with contrast-enhanced CT and perfusion scintigraphy images Inspiratory/expiratory images of pixel value change rate for chronic obstructive pulmonary disease Discussion of the potential benefits of dynamic chest radiography for patients Conclusion

CH113-ED-X

Chest Radiographic Appearance of Minimally Invasive Cardiac Implants and Support Devices-What You Need to Know

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Scott Cressman, MD, Detroit, MI (*Presenter*) Nothing to Disclose
David L. Spizarny, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Chad Klochko, MD, Farmington Hills, MI (*Abstract Co-Author*) Nothing to Disclose
Jeffrey D. Nadig, MD, Saline, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To recognize the chest radiographic appearance of common minimally invasive structural heart implants, including valve replacements, valve repairs, and occlusion devices. To recognize the chest radiographic appearance of common minimally invasive cardiac support devices. To understand clinical indications and appreciate potential complications of minimally invasive cardiac implants and support devices.

TABLE OF CONTENTS/OUTLINE

Normal cardiac anatomy and approximate valve locations on chest radiograph Clinical indications, characteristic chest radiographic appearance, and physical appearance of the following, with CT correlation for select devices: Transcatheter valve replacements Aortic valve replacement (TAVR) Mitral valve replacement (TMVR) Mitral valve repair (mitral clip) Caval valve implantation (CAVI) Minimally invasive occlusion devices Transcaval access occluder Left atrial appendage (LAA) occlusion device (Watchman) Left atrial appendage (LAA) closure by LARIAT procedure Atrial septal defect (ASD) occlusion devices Ventricular septal defect (VSD) occlusion devices Minimally invasive cardiac support devices Percutaneous ventricular assist device (Impella) Implantable loop recorders Intra-aortic balloon pump Potential complications Summary

CH114-ED-X

Dissecting Non-traumatic Thoracic Aortic Disease: A Radiographic Review and Guide

All Day Room: CH Community, Learning Center

Participants

Jose Concepcion, MD, MPH, Brooklyn, NY (*Presenter*) Nothing to Disclose
Leah H. Portnow, MD, Brooklyn, NY (*Abstract Co-Author*) Nothing to Disclose
Jonathan M. Goldstein, MD, Brooklyn, NY (*Abstract Co-Author*) Nothing to Disclose
Maryanne Ruggiero, MD, Brooklyn, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review the pathophysiology and complications of thoracic aortic aneurysm, pseudoaneurysm, and dissection2. Provide a pictorial case review of these entities, their complications, and treatment planning.3. Discuss the radiologist's role in detection, guidance, and current management of thoracic aortic disease with discussion of the literature and case examples from our own institution.

TABLE OF CONTENTS/OUTLINE

Non-traumatic Thoracic Aortic Disease1. Pathophysiology - Dissection
- Aneurysm and Pseudoaneurysm2. Etiology -Genetic Syndromes3. Diagnosis/Imaging Appearance -ACR Appropriateness Criteria 1. Noncontrast CT
2. CT angiogram -Thoracic aortic aneurysm -Thoracic aortic dissection a. Classic
b. Intramural Hematoma
c. Penetrating atherosclerotic ulcer4. Role of Guidance/Management: How the Radiologist Can Help the Vascular Surgeon
a. Distinguishing between true and false lumens
b. Identifying type of dissection and branch-vessel involvement
c. Endovascular Repair5. Complications a. Thoracic Aortic Aneurysm Endoleaks

CH115-ED-X

Vanishing Bone Metastasis: An Underdiagnosed Condition

All Day Room: CH Community, Learning Center

Participants
Erina M. Nagaya, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Fabio T. Jojima, MD, BEng, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Adriano S. Seabra, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Elaine Yanata, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcio V. Sawamura, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Ricardo Guerrini, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to: Explain and discuss the vanishing bone metastasis phenomenon Review the collateral venous anatomy of the chest and mediastinum Show examples of vanishing bone metastasis

TABLE OF CONTENTS/OUTLINE

Vanishing bone metastasis (VBM) is a pitfall in contrast-enhanced computed tomography (CT) in patients with thoracic vein thrombosis, mainly in superior vena cava and brachiocephalic veins and usually related to malignant tumors.In CT it appears as a pseudopathologic vertebral body enhancement due to collateral paravertebral venous plexus and can be misdiagnosed as a sclerotic bone metastasis, leading to unnecessary treatment. Although not rare, this finding is usually underdiagnosed by radiologists.We will briefly review some of the collateral venous pathways in superior vena cava syndrome with a focus in the VBM phenomenon.

CH116-ED-X

Catching Rays: How to Use Ray-sum Imaging in Chest Radiology

All Day Room: CH Community, Learning Center

Participants
Takahisa Kurosaki, MD, Tokyo, Japan (*Presenter*) Nothing to Disclose
Yasuyuki Kurihara, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaki Matsusako, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuka Okajima, MD, MPH, Chuo-ku, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriko Tanio, MD, Chuo City, Japan (*Abstract Co-Author*) Nothing to Disclose
Midori Enokido, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoki Kyosaka, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:1. To explain what Ray-sum images are2. To demonstrate Ray-sum images behave like free-rotating radiographs, that is, viewable from any arbitrary trajectory3. To demonstrate utility of Ray-sum images that allows better understanding of what is present on radiographs and help troubleshoot the cause of radiograph abnormality when a CT correlate is not found

TABLE OF CONTENTS/OUTLINE

1. Background of Ray-sum images2. Creating and viewing Ray-sum images3. Anatomy on Ray-sum images4. Classical radiology signs as seen on Ray-sum images - Silhouette sign - Hilum overlay sign - Incomplete border sign and extrapleural sign - Deep sulcus sign - Continuous diaphragm sign - and so on5. Radiology case questions by chest radiographs, answers by CT images and Ray-sum images

CH117-ED-X

'Tricks of the Trade': Maximising Diagnostic Utility of the Barium Esophogram in the Functional Assessment of the Esophagus

All Day Room: CH Community, Learning Center

Participants
Stephen P. Power, MBBCh, MRCPI, Cork, Ireland (*Presenter*) Nothing to Disclose
Owen J. O'Connor, MBBCh, Cork, Ireland (*Abstract Co-Author*) Nothing to Disclose
Edward Fitzgerald, MBBCh, Cork, Ireland (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

With the widespread use of endoscopy, and reduced emphasis on fluoroscopic evaluation of the esophagus, the barium esophogram has seen its role in the clinical sphere dwindle. However, the study provides unique information on the functional integrity of the esophagus, which is often missed due to sub-optimal technique.To address these challenges this exhibit will: Highlight the modern role of the barium esophogram Demonstrate useful, often forgotten, technical tips to help maximise the utility of the examination Display accompanying fluoroscopic imaging from our institution (where there is a large upper GI surgical service)

TABLE OF CONTENTS/OUTLINE

To illustrate these teaching points this exhibit will: Highlight disorders where barium remains first line for diagnosis. Discuss associated pathophysiology Highlight techniques which maximise diagnostic utility of the study with illustrative imaging Exposing dysmotility Barium column test Barium coated marshmallow swallow Patient positioning - demonstrate superiority of prone oblique positioning versus erect positioning Demonstrating primary and secondary signs of gastroesophageal reflux Water siphon test Patient positioning and Valsalva manoeuvres Associated features: Cricopharyngeal bar, hiatal hernia and distal mucosal rings

CH120-ED-X

Thymic Imaging of Adults: The Spectrum of Image Manifestation of Normal and Abnormal Thymus

All Day Room: CH Community, Learning Center

Participants

Tetsuro Araki, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Mizuki Nishino, MD, MPH, Boston, MA (*Abstract Co-Author*) Consultant, Bristol-Myers Squibb Company; Institutional Research Grant, Canon Inc; Institutional Research Grant, Merck & Co, Inc
Yoshitake Yamada, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hiroto Hatabu, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, AZE, Ltd; Research Grant, Canon Inc; Research Grant, Konica Minolta Group

TEACHING POINTS

(1) Review the spectrum of the appearance of normal thymus in adults(2) Describe the imaging and clinical characteristics associated with thymic involution(3) Demonstrate the image findings that help to differentiate between normal thymus and benign and malignant thymic pathology

TABLE OF CONTENTS/OUTLINE

(1) Basic anatomy and embryology of the thymus- Mediastinal anatomy- Embryology and locations of ectopic thymic tissue.(2) Normal shape and appearance of the thymus- Classic description of thymic shape- Evaluation of thymic size and CT density(3) Imaging and clinical features associated with thymic involution- Age, sex, cigarette smoking, BMI, physical stress.(4) Pearls and pitfalls for accurate diagnosis of thymic abnormalities- Thymic hyperplasia: true vs lymphoid hyperplasia- Thymoma and thymic carcinoma- Thymic cyst: unilocular (congenital) vs multilocular (acquired) cysts(5) Usefulness of chemical shift MRI(6) PET/CT- Interpretation of FDG uptake: Physiologic FDG uptake and SUVmax in thymic malignancies(7) Conclusions - Systematic approach for the accurate diagnosis of thymic lesions

CH121-ED-X

Top 10 Things You Don't Want to Miss in Cardiothoracic Imaging

All Day Room: CH Community, Learning Center

Participants
Jaime Atiles, MENG,MD, San Juan, PR (*Presenter*) Nothing to Disclose
Amanda P. Marrero Gonzalez, BSC,MD, San Juan, PR (*Abstract Co-Author*) Nothing to Disclose
Felipe G. Rodriguez-Ruiz, MD, Caguas, PR (*Abstract Co-Author*) Nothing to Disclose
Stephanie C. Torres Ayala, MD, Mayaguez, PR (*Abstract Co-Author*) Nothing to Disclose
William H. Titley Diaz, BS, Bayamon, PR (*Abstract Co-Author*) Nothing to Disclose
Jose A. Maldonado, MD, San Juan, PR (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To discuss key and characteristic findings, common misconceptions, mimickers and basic patient management of the top 10 cardiothoracic conditions that represent the highest mortality or morbidity if left untreated.The 10 highlighted cardiothoracic conditions include: acute ascending aortic dissection, aortic rupture, pulmonary embolism, large pericardial effusions, tension pneumothorax, bronchial ruptures, among others. The educational exhibit is geared towards medical students, radiology residents and physicians from other specialties, but also serves as a review for more experienced radiologists.

TABLE OF CONTENTS/OUTLINE

Imaging modalities have always been front-runners in diagnosing cardiothoracic pathologies. Certain cardiothoracic conditions may cause high mortality and morbidity if their diagnosis and treatment is delayed. By becoming familiar with their radiologic appearance, proper management may be instituted expeditiously. We will discuss the most characteristic findings in chest x-rays, CT and MRI of such cardiothoracic pathologies, which include acute ascending aortic dissection, aortic rupture, pulmonary embolism, large pericardial effusions, bronchial ruptures, cavitary masses, malposition of tubes and catheters. We will present common misconceptions, mimickers and basic patient management of these conditions using a quiz format.

CH122-ED-X

Choosing the Right Target: Role of SBRT in Management of Lung Cancer and Oligometastatic Disease in Lung Cancer

All Day Room: CH Community, Learning Center

Awards
Cum Laude
Identified for RadioGraphics

Participants
Jennifer A. Febbo, Chicago, IL (*Presenter*) Nothing to Disclose
Ramya S. Gaddikeri, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Palmi N. Shah, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. SBRT has a role in N0 NSCLC and in treating selective oligometastatic disease.2. Patterns of CT findings in early phase and late phase post-SBRT induced lung injury.3. There are differences in the timeline for CT changes between conventional and SBRT induced lung injury4. Recognize tumor recurrence from expected changes post SBRT lung injury5. Gain knowledge of complications that can arise from SBRT

TABLE OF CONTENTS/OUTLINE

1. Describe types of radiotherapy used in lung cancer with brief review on therapeutic technique of SBRT2. Clinical background: Indications of SBRTa. Primary lung malignancy confined to lungi. Non-operable non-small cell lung cancer (NSCLC).ii. Growing use in operable early NSCLCb. Oligometastatic disease eg. Liver, adrenal metastases.3. Describe CT findings in the post-SBRT lung: early phase and late phase changesa. 5 imaging patterns of acute radiation pneumonitis, case examplesb. 4 Imaging patterns of radiation fibrosis, case examples4. Outline role of SBRT in oligometastatic disease with case examples5. Highlight differences in timeline between CT patterns of conventional and SBRT induced lung injury6. Differentiate expected post SBRT lung changes from tumor recurrence7. Delineate other complications associated with SBRT with case examples

CH123-ED-X

Dye in Vein: Thoracic Venous Congenital Anomalies on Computed Tomography

All Day Room: CH Community, Learning Center

Participants
Yayone Rivaud, MD, Newark, NJ (*Presenter*) Nothing to Disclose
Pierre D. Maldjian, MD, West Caldwell, NJ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Radiologists are often confronted by unanticipated venous abnormalities of the thorax during interpretation of CT studies. Correct diagnosis of these disorders may reduce unnecessary workup. The purpose of this exhibit is to 1) illustrate characteristic imaging findings of unusual congenital thoracic venous anomalies on CT 2) discuss features that facilitate their recognition in daily clinical practice 3) discuss the clinical significance of these venous anomalies.

TABLE OF CONTENTS/OUTLINE

This presentation features a case-based illustration of selected congenital venous anomalies as depicted on CT in adults. The presentation is organized into 3 categories: 1) anomalies of the superior vena cava and brachiocephalic vein 2) anomalies of the inferior vena cava and azygos system 3) anomalies of the pulmonary veins. Venous anomalies to be reviewed include: persistent left superior vena cava, retroaortic left subclavian vein, azygos continuation of the inferior vena cava, hemiazygos continuation of the inferior vena cava, absence of the azygos vein, partial anomalous pulmonary venous return, scimitar vein, pulmonary vein varix, and levoatriocardinal vein.

CH124-ED-X

Peeling Back the Layers of the Chest Wall: Systematic Layer-based Approach to Differential Diagnosis of Chest Wall Masses with Radiologic-Pathologic Correlation

All Day Room: CH Community, Learning Center

Participants
Khalid I. Hassan, MD, Boston, MA (*Presenter*) Nothing to Disclose
Kitt Schaffer, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Define the anatomy of the chest wall. 2. Describe chest wall mass imaging algorithm. 3. Utilize a chest wall layer-based approach to chest wall mass interpretation and differential diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Review of chest wall anatomy. 2. Basic algorithm of chest wall mass imaging work-up. 3. Chest wall compartment based differential diagnosis with breakdown of diagnosis by chest wall layer of origin. 4. Radiology-Pathology correlation cases (cases to include sternal body plasmacytoma, synovial cell sarcoma of the pectoralis major muscle, liposarcoma of the chest wall, peripheral nerve sheath tumor of the intercostal space). 5. Summary.

CH125-ED-X

Ferumoxytol-Enhanced Thoracic MRA: Pictorial Review of Routine and Novel Clinical Applications

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Certificate of Merit

Participants
Abigail V. Berniker, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Kimberly G. Kallianos, MD, San Franicsco, CA (*Presenter*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
Karen G. Ordovas, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Thomas A. Hope, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, Consultant, GE Healtcare
Michael D. Hope, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Ferumoxytol has unique properties that make it an excellent intravascular MRI contrast agent, particularly in patients with renal failure Routine thoracic applications of ferumoxytol MRA: surveillance of aortic aneurysm/dissection; rule out pulmonary embolism (PE); evaluation of coronary anomalies Novel thoracic applications of ferumoxytol MRA: pre-procedural planning; aortic 4D flow; evaluation of vasculitis

TABLE OF CONTENTS/OUTLINE

Goals-Provide overview of ferumoxytol-enhanced MRA -Highlight routine and emerging clinical thoracic applications through case-based pictorial review**Overview**-Ferumoxytol, an ultrasmall superparamagnetic iron oxide particle, is FDA-approved to treat iron deficiency in renal failure; its superparamagnetic properties have prompted off-label use as an MRI blood pool contrast agent-Advantages over other contrast agents: Safe in renal failure (GFR < 30) Stays in intravascular space >12 hours (large window between injection and image acquisition) Phagocytosed by macrophages (possible inflammatory biomarker) Avoids radiation, iodinated contrast, and gadolinium**Pictorial review**-Routine uses: Aortic aneurysm/dissection surveillance; coronary anatomy characterization; PE evaluation-Novel applications: Procedural planning (e.g. TAVR or pulmonary vein mapping); 4D flow; vasculitis evaluation**Summary**

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/

Travis S. Henry, MD - 2016 Honored Educator

CH126-ED-X

Metastatic Disease in the Chest: Mechanisms of Spread and Potential Pitfalls

All Day Room: CH Community, Learning Center

Participants

Girish S. Shroff, MD, Houston, TX (*Presenter*) Nothing to Disclose
Chitra Viswanathan, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Marcelo K. Benveniste, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Patricia M. de Groot, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Carol C. Wu, MD, Houston, TX (*Abstract Co-Author*) Author, Reed Elsevier
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Metastatic disease to the lungs may occur via 3 routes of spread: hematogenous, lymphatic, and endobronchial. Awareness of the spectrum of appearances of metatastic disease is important in avoiding misinterpretation.

TABLE OF CONTENTS/OUTLINE

Hematogenous Metastases -benign tumors e.g., uterine leiomyoma, hydatidiform mole, giant cell tumor, chondroblastoma -malignant tumors e.g., cancers of the lung, breast, colon, kidney -CT appearance: mass vessel sign, tumor emboli nodule morphology (solid, ground glass halos, mixed attenuation, cavitary, calcified/ossified, fat-containing) nodule growth rate (slow growth eg. thyroid cancer vs fast growth e.g., melanoma, sarcoma) Lymphangitic Metastases -involves pulmonary lymphatics and surrounding interstitium -may result from retrograde spread from mediastinal/hilar lymph nodes -include carcinomas of the lung, breast, stomach, pancreas -DDx: sarcoidosis, lymphomaEndobronchial Metastases -direct deposition, either aspiration of tumor cells or lymphatic or hematogenous spread and direct invasion from tumor in the adjacent lung or lymph nodes -include tumors of the kidney, skin, thyroid, breast, colon -CT appearance: lobar, segmental, or subsegmental atelectasis associated with postobstructive pneumonia

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/

Mylene T. Truong, MD - 2015 Honored Educator

CH127-ED-X

What Every Radiologist Should Know about New Radiotherapy Techniques and the Spectrum of Lung Abnormalities Associated

All Day Room: CH Community, Learning Center

Participants

Ana Alvarez Vazquez, Madrid, Spain (*Presenter*) Nothing to Disclose
Chawar Hayoun, Pozuelo De Alarcon, Spain (*Abstract Co-Author*) Nothing to Disclose
Antonio Maldonado, MD, Pozuelo De Alarcon, Spain (*Abstract Co-Author*) Nothing to Disclose
Ana Fernandez Alfonso, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Javier Carrascoso Arranz, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Vicente Martinez, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

-To describe the most important characteristics of each radiotherapy technique: 3D-CRT, IMRT and SBRT.-To recognize the different imaging appearances of radiation pneumonitis depending on the technique of radiotherapy, dose used and time since the last dose.- To know the possible impact of concomitant chemotherapy on radiation lung disease.- To discuss radiologic differentiation of lung abnormalities secondary to radiation therapy from infection, malignancy and other less common diagnosis.- To learn the important role of PET-CT to distinguish radiation changes from malignancy.

TABLE OF CONTENTS/OUTLINE

A. New treatment techniques (radiation therapy)B. Effects of radiation in the lungC. Radiological findings related to each radiotherapy techniqueD. PathophysiologyE. Differential diagnosis of radiation lung diseaseF. Diagnostic Imaging: CT and the important role of PET-CT

CH128-ED-X

MDCT of the Esophagus with 2D MPRs and 3D Rendering: Unusual Diagnoses and Interpretative Pearls

All Day Room: CH Community, Learning Center

Participants

Ryan Stephens, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Pamela T. Johnson, MD, Baltimore, MD (*Presenter*) Consultant, National Decision Support Company
Margaret Fynes, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Elliot K. Fishman, MD, Baltimore, MD (*Abstract Co-Author*) Institutional Grant support, Siemens AG; Institutional Grant support, General Electric Company;

TEACHING POINTS

MDCT plays an important role in evaluating the esophagus for cancer pretreatment staging and post-treatment surveillance, in the post-operative setting if complications are suspected, and if perforation is suspected. The imaging findings in these settings are well described. The purpose of this exhibit is to demonstrate a range of unusual esphageal pathology illustrate the importance of multiplanar evaluation using 2D multiplanar reconstructions and 3D rendering for accurate characterization of disease

TABLE OF CONTENTS/OUTLINE

Technique IV contrast Oral contrast MPRs and 3D renderingPathology duplication cyst ruptured into the esophageal lumen intramural hematoma chronic paraesophageal abscess secondary to remote perforation esphageal perforation resulting in thoracic spine disciitis and osteomyelitis gastric volvulus with esophageal obstruction enormous hiatal hernia esophagitis mimicking a mass vascular malformation uphill varices mimicking a mass giant varices downhill varices tracheoesophageal fistula aortoesophageal fistula

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/

Pamela T. Johnson, MD - 2016 Honored Educator
Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Elliot K. Fishman, MD - 2016 Honored Educator

CH129-ED-X

Hypersensitivity Pneumonitis: Mimics, Pearls & Pitfalls

All Day Room: CH Community, Learning Center

Participants

Andrea L. Magee, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Jonathan H. Chung, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
Steven M. Montner, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:1. To review the epidemiology and pathophysiology of hypersensitivity pneumonitis (HP), the spectrum of radiologic findings characteristic of acute, subacute and chronic HP, and features helpful in distinguishing HP from imaging mimics2. To demonstrate the correlation between histologic changes in subacute and chronic HP and their respective imaging findings, utilizing microscopy images from our pathology department.

TABLE OF CONTENTS/OUTLINE

A. Pathophysiology and review of causative antigens a. Histologic changes with accompanying microscopy slides B. Diagnostic Testing: Serum Precipitins, Specific Inhalation Challenge, PFTs, BAL, Biopsy.C. Acute HP a. CXR and HRCT findings of pathology-proven (via biopsy or autopsy) examples D. Subacute HP a. CXR and HRCT findings of pathology-proven examples b. Headcheese sign. c. Mimics of Subacute HP: RB-ILD, SarcoidosisE. Chronic HP a. CXR and HRCT findings of pathology-proven (via biopsy or autopsy) examples b. Mimics of Chronic HP: IPF, NSIP i. Discussion of the ATS/ERS/JRS/LATA guidelines and algorithmic approach regarding HRCT findings in fibrotic lung disease. F. Prognostic factors and importance of early accurate diagnosis via imaging.

Honored Educators

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Jonathan H. Chung, MD - 2013 Honored Educator

CH130-ED-X

Rare Idiopathic Interstitial Pneumonias: Radiologic and Histologic Findings

All Day Room: CH Community, Learning Center

Participants

Prachi P. Agarwal, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Elizabeth Lee, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
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Eric White, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Understand the category of rare idiopathic interstitial pneumonias (IIP) in the new updated classification of IIP. Recognize the radiologic and histologic findings of rare IIPs. Develop an understanding of the presentation, prognosis and treatment options.

TABLE OF CONTENTS/OUTLINE

1. New category of rare IIPs : -Idiopathic pleuroparenchymal fibroelastosis-Idiopathic lymphoid interstitial pneumonia 2. Idiopathic pleuroparenchymal fibroelastosis-Imaging findings and pathologic correlation Sample cases and mimics-Clinical course and treatment options3. Idiopathic lymphoid interstitial pneumonia (LIP)-Most cases of LIP are associated with other conditions-Idiopathic LIP is included in rare IIPs. -Imaging findings Sample cases and mimics-Clinical course and treatment4. Other rare histologic types- Controversial IIP entities will be discussed under this section Acute fibrinous organizing pneumonia Bronchiolocentric patterns of interstitial pneumonia

Honored Educators

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Sudhakar N. Pipavath, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2015 Honored Educator

CH131-ED-X

Diaphragm: No Strict Border?

All Day Room: CH Community, Learning Center

Participants
Anne Sophie Claes, MD, Brussels, Belgium (*Presenter*) Nothing to Disclose
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Benoit Ghaye, MD, PhD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review the embryology and anatomy of the diaphragm
2. To illustrate the various mechanisms of transdiaphragmatic migration of structures or spread of diseases
3. To present pitfalls and illustrate their differential diagnosis

TABLE OF CONTENTS/OUTLINE

1. Embryology, anatomy and pathophysiology of the diaphragm2. How/why ?2a. Anatomic diaphragmatic apertures2b. Congenital defects2c. Structural defects2d. Acquired defects2d1. Traumatic2d2. Iatrogenic2e. Abnormal vascular connections2f. Abdominal-thoracic interactions due to circulating factors3. What ?3a. Air3b. Fluid3b1. Hepatic hydrothorax3b2. Peritoneal dialysis3b3. Pancreatic collections3b4. Meig's syndrome3c. Infections3c1. Hydatid cyst3c2. Others3d. Tumor3d1. Benign (endometriosis)3d2. Malignant (thymoma, mesothelioma, lung cancer, abdominal malignancies)3e. Organs3e1. Through congenital defects (Morgagni and Bochdalek hernias)3e2. Through acquired defects (hiatal hernia, diaphragmatic rupture)4. Pitfalls and differential diagnosis5. Conclusions6. Bibliography

CH132-ED-X

Lung Ultrasound Tutorial

All Day Room: CH Community, Learning Center

Participants
Laura Martelius, Helsinki, Finland (*Presenter*) Nothing to Disclose

TEACHING POINTS

Ultrasound (US) artifacts of the lung surface can be used for diagnosis of lung disease. This educational exhibit aims to explain the basic principles of lung US. It first briefly describes the tissue interactions important for image reconstruction in conventional US of soft tissues and explains why ultrasound devices cannot form anatomical images of inflated lungs. It then describes typical lung US artifacts for normal and diseased lungs and reviews the suggested mechanisms of these artifacts.

TABLE OF CONTENTS/OUTLINE

A.Tissue interactions of the US pulse in conventional US of soft-tissuesB.Variable of the acoustic properties of tissue: Acoustic impedanceC.Horizontal lung US artifacts (A-lines) in normal lungs (reverberation artifacts)D.Vertical lung US artifacts (B-lines) in diseased lungs (ring-down artifacts)

CH133-ED-X

Pulmonary Foreign Body Granulomatosis: A Review of Clinical and Imaging Features and its Differential Diagnosis

All Day Room: CH Community, Learning Center

Participants
Yueyang Guo, MD, San Jose, CA (*Presenter*) Nothing to Disclose
Peter Phan, MD, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to bring awareness of this uncommon cause of diffuse pulmonary micronodular disease. This exhibit will perform the following:
1. Review the pathophysiology, risk factors, and clinical features of pulmonary foreign body granulomatosis.
2. Review the basic patterns of pulmonary micronodular disease.
3. Describe the imaging appearance of pulmonary foreign body granulomatosis.
4. Review the differential for pulmonary foreign body granulomatosis.

TABLE OF CONTENTS/OUTLINE

1. Pathophysiology
2. Epidemiology & risk factors
3. Clinical features
4. Review of basic patterns of pulmonary micronodular disease
- Centrilobular pattern
- Random pattern
- Perilymphatic pattern
- Tree-in-bud pattern
5. Imaging features of pulmonary foreign body granulomatosis
6. Differential diagnosis illustrated by cases
7. Summary

CH134-ED-X

Anterior Mediastinal Masses: A More Detailed and Practical Approach

All Day Room: CH Community, Learning Center

Participants
Daniel B. Green, MD, New York, NY (*Presenter*) Nothing to Disclose
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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

TEACHING POINTS

Radiologists frequently use the classic differential diagnosis (thymoma, teratoma, thyroid, and terrible lymphoma) when confronted by a solid anterior mediastinal mass. We present a practical approach to anterior mediastinal masses that will allow the radiologist to narrow the classic differential diagnosis based on factors such as age, gender, morphology, and composition. The following entities will be presented.

TABLE OF CONTENTS/OUTLINE

1) Thymic Hyperplasia
2) Thymic Cyst
3) Thymoma
4) Invasive Thymoma
5) Thymic Carcinoma
6) Lymphoma
7) Germ Cell Tumor
8) Thyroid
9) Lymphatic Malformation

Honored Educators

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Sanjeev Bhalla, MD - 2014 Honored Educator
Sanjeev Bhalla, MD - 2016 Honored Educator

CH135-ED-X

Approach to Diffuse Pulmonary Lung Disease

All Day Room: CH Community, Learning Center

Participants
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Gautham P. Reddy, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Epidemiology and clinical manifestations of diffuse pulmonary lung disease (DPLD)2. Radiologic patterns of diffuse pulmonary lung disease3. Clinical and radiologic clues to narrow down the differential diagnosis

TABLE OF CONTENTS/OUTLINE

This educational exhibit will illustrate an organized step-by-step approach for diagnosing diffuse pulmonary lung disease. Clinical clues such as clinical manifestation, time course of the disease, environmental exposure, connective tissue disease, cigarette smoking will be incorporated with radiologic pattern to narrow down the differential diagnosis. We will also discuss the timing and need of the invasive diagnostic procedures when specific diagnosis can be reached on the basis of radiologic pattern and clinical clues.

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Sudhakar N. Pipavath, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2015 Honored Educator
J. D. Godwin, MD - 2013 Honored Educator
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CH136-ED-X

Benign Lung Changes on MDCT after Stereotactic Body Radiation Therapy

All Day Room: CH Community, Learning Center

Participants
Rollin Y. Yu, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Devin Schellenberg, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
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Maryam Dosani, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Charlotte J. Yong-Hing, MD, FRCPC, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To discuss the increasing role of Stereotactic Body Radiation Therapy (SBRT) in the treatment of early lung cancer2. To review the common post-SBRT lung changes on MDCT, broken down into acute and late patterns3. To contrast benign post-SBRT lung changes with examples of local tumor recurrence

TABLE OF CONTENTS/OUTLINE

1. Introduction to Stereotactic Body Radiation Therapy (SBRT)2. RT-induced injury Pathogenesis Common toxicities3. Mimics of RT-induced lung injury with imaging examples4. SBRT-induced lung changes with imaging examples Acute changes i. Diffuse consolidation ii. Patchy consolidation iii. Diffuse ground glass opacity iv. Patchy ground glass opacity Late changes i. Modified convention pattern ii. Mass-like pattern iii. Scar-like pattern 5. Evolution of post-SBRT lung changes on MDCT Three MDCT examples with images taken at pre-treatment and post-treatment time intervals6. Is it local recurrence? MDCT examples7. Summary8. Acknowledgements9. References

CH137-ED-X

The Unusual Suspect: Pulmonary Venous Infarction

All Day Room: CH Community, Learning Center

Participants
Lila Pourzand, MD, Los Angeles , CA (*Presenter*) Nothing to Disclose
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Fereidoun G. Abtin, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Pulmonary venous infarction, a rare condition, is a difficult clinical and radiographic diagnosis with dismal outcome if left untreated. It is essential for the radiologist to recognize this pattern of infarction and to be able to differentiate it from more commonly observed pulmonary arterial infarction. After reviewing this presentation, participants will be able to:1. Understand pulmonary venous anatomy.2. Learn about etiologies of pulmonary venous infarction in different clinical settings.3. Recognize imaging features of pulmonary venous infarction.4. Learn about diagnostic work up for confirmation of pulmonary venous infarction and available treatment options.

TABLE OF CONTENTS/OUTLINE

1. Normal pulmonary venous anatomy and variants.2. Etiologies of pulmonary venous infarction.3. Imaging feature of pulmonary venous infarction and diagnostic pitfall.4. Discuss four cases of pulmonary venous infarction and review their imaging findings.5. Discuss diagnostic workup and potential treatment options for pulmonary venous infarction.

CH138-ED-X

Spectrum of Paraseptal Cystic CT Lung Findings in Seen in Several Evolving Genetically Defined Diseases, Highlighting Application of a Radiogenomic Lookup Table

All Day Room: CH Community, Learning Center

Participants

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Adriana A. de Jesus, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Joshua D. Milner, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Pictorial description of early diffuse paraseptal cysts seen in recently discovered genetically defined diseases a. Early recognition is paramount since subtle findings can alert to rapid devastating clinical course b. Expand differentials to include evolving genetic predispositions2. Highlight an example child exhibiting imaging severity spectrum3. Disease natural history progression may be better understood with radiogenomic atlases

TABLE OF CONTENTS/OUTLINE

1. Severity spectrum atlas includes: a. Single layered peripheral cysts including along fissures and medially b. Progression to multiple layered cysts (honeycomb similar to end stage lung) c. Diffuse variably sized parenchymal cysts then extend beyond periphery d. Continued increase in size and number of cysts, to eventual pneumothoraxHighlight example 12 y/o with STAT3GOF that progressed from subtle paraseptal emphysema to chronic bilateral pneumothoraces requiring bilateral lung transplants by age 16.2. Our radiogenomic lookup table augmented discovery of similar unusual findings across several genetically defined diseases. a. Radiographic biomarkers are becoming increasingly evident in recently discovered genetically defined diseases, several yet to be named or published b. For example one third of our GATA2 deficiency patients had paraseptal cysts.

CH139-ED-X

Quantification of Pulmonary Nodule: Prediction of Malignancy and Prognosis

All Day Room: CH Community, Learning Center

Participants
Masahiro Yanagawa, MD, PhD, Suita, Japan (*Presenter*) Nothing to Disclose
Osamu Honda, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriko Kikuchi, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Akinori Hata, MD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Tomiyama, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Many computer-aided diagnosis systems have been developing. Recently, Quantitative Imaging Biomarkers Alliance (QIBA) is investigating volumetric data and analytic methods for the fulfillment of universal standard. Volumetric measurement is a promising technique that enables accurate and reproducible quantification for lung cancer.The purpose of this exhibit is:1. To learn advantages and disadvantages between simple manual measurements and quantitative measurements using volumetry for evaluating lung cancer2. To review the quantitative analyses in lung cancer to predict malignancy and/or prognosis

TABLE OF CONTENTS/OUTLINE

1. Objectivities and Reproducibility measurements: manual method v.s. automated method2. Prediction for malignancy and/or prognosis- Ground-glass nodule mass measurements (GGN mass) - Growth rate assessment: doubling time etc.- Volumetric measurements for prognostic prediction 3. Prediction for invasive components in lung adenocarcinoma- Mapping of distribution of CT density in nodule- Texture analysis4. Future directions and summary

CH140-ED-X

Smoking Related Interstitial Lung Disease: A Puzzling Problem in Interstitial Pneumonias

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Tae Iwasawa, MD, PhD, Yokohama, Japan (*Presenter*) Research Consultant, Ono Pharmaceutical Co, Ltd.; Speaker, Shionogi & Co, Ltd
Tamiko Takemura, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomohisa Baba, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Takashi Ogura, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshiyuki Gotoh, PhD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Smoking-related interstitial lung diseases (SR-ILDs) co-exist with idiopathic interstitial pneumonias (IIPs) in smokers and modify the radiological findings.2. In some cases, SR-ILDs show similar findings to chronic fibrosing IPs idiopathic pulmonary fibrosis (IPF) and non-specific interstitial pneumonia (NSIP), although their prognoses are different.3. Therefore, it is important to distinguish chronic fibrosing IPs and SR-ILDs.4. Quantitative computer-aided analysis of computed tomographic (CT) images will be helpful for evaluating disease progression.

TABLE OF CONTENTS/OUTLINE

1. Review of radiological and pathological findings of SR-ILDs (respiratory bronchiolitis [RB], desquamative interstitial pneumonia [DIP], and air-space enlargement with fibrosis [AEF])2. Review of imaging features of chronic fibrosing IPs in smokers with histologicalfindings3. Disease progression and prognosis of SR-ILDs and chronic fibrosing IPs4. Hints to differentiate chronic fibrosing IPs from SR-ILDs among smokers using computer-aided, quantitative analysis of CT

CH141-ED-X

It is Just a Tube. What Can Go Wrong? The Gamut of Primary and Secondary Tracheal Diseases

All Day Room: CH Community, Learning Center

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

TEACHING POINTS

Purpose/aim: The trachea is a single hollow organ contained within the neck and upper chest playing a major role in transporting air and oxygen to the alveoli. Frequently overlooked by radiologists, this organ can be affected not only by primary tracheal diseases but also by pathologies arising from the surrounding mediastinal structures. Familiarity with specific and nonspecific tracheal imaging abnormalities may lead to a final diagnosis. This educational exhibit illustrates the gamut of primary and secondary pathologies affecting the trachea.**Teaching Points:** Review the tracheal anatomy and the anatomical variants. Illustrate the gamut of congenital and acquired pathologies of the trachea. Recognize the typical imaging features of tracheal diseases on different imaging modalities.

TABLE OF CONTENTS/OUTLINE

Content organization: Anatomy of the trachea and its surrounding structures. Congenital diseases of the trachea. Acquired diseases of the trachea. Neoplastic. Non-neoplastic. Nontracheal mediastinal pathology and its impact on tracheal function.

CH143-ED-X

Fundamentals of Dynamic Chest Radiography: Low-cost and High Performance Functional Imaging

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Certificate of Merit

Participants
Rie Tanaka, PhD, Kanazawa, Japan (*Presenter*) Nothing to Disclose
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Isao Matsumoto, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuo Kasahara, MD, PhD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Keita Sakuta, RT, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasushi Kishitani, Tokyo, Japan (*Abstract Co-Author*) Employee, Toyo Corporation

TEACHING POINTS

To understand the fundamental observations, imaging procedures, and diagnostic performances of dynamic chest radiography with a non-contrast flat-panel detector (FPD).

TABLE OF CONTENTS/OUTLINE

Projected respiratory physiology (Ventilation, circulation, diaphragm motion) Imaging procedures & patient dose Visualization technique Case reports (Emphysema, asthma, pneumonia, perioperative lobectomy, atelectasis, etc.)

CH146-ED-X

Thoracic Outlet/Inlet 'Edge of the Film'

All Day Room: CH Community, Learning Center

Participants
Santosh K. Selvarajan, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Rashmi Balasubramanya, MD, Darby, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Discuss the radiologic anatomy, pathology, diagnostic criteria, and clinical components of Thoracic outlet syndromes and lesions.
2. Heighten awareness of often overlooked lesions at the edge of the film on a neck CT or on a chest CT.

TABLE OF CONTENTS/OUTLINE

1. Emphasize and illustrate the common thoracic outlet syndromes (vascular and neurogenic): superior vena cava syndromes, arterial dissections, aneurysms, venous thromboses, stenosis, and neurogenic lesions.2. Illustrate lesions which may cause clinical symptoms of outlet syndromes like mediastinal extension of neck pathology from thyroid gland, parathyroid gland, thymo-pharyngeal cysts, retropharyngeal abscess/hematomas; lesions extending from the mediastinum in to neck like lymphangioms, lipodystrophy, metastases; lesions of lung apex like pancoast tumors, and lesions of the sternum, clavicle, and first rib.

CH147-ED-X

Thoracic Amyloidosis: When to Suspect?

All Day Room: CH Community, Learning Center

Participants
Guilherme d. Ramin, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Mark Wanderley, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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Vivian C. Silva, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Hye J. Lee, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Ricardo Guerrini, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to: Brief review of amyloidosis Review the thoracic manifestations of amyloidosis To show key findings in the diagnosis

TABLE OF CONTENTS/OUTLINE

Amyloidosis is a rare group of disease characterized by abnormal extracellular deposition of insoluble proteins, and can produce considerable morbidity and mortality. It may be a primary disease or more commonly secondary to chronic disease. Imaging findings are often nonspecific, making a diagnostic challenge for the radiologist.This presentation will brief review and illustrate thoracic manifestations of amyloidosis with cases from our archives, including nodular parenchymal amyloidosis, diffuse alveolar septal amyloidosis, airway amyloidosis and cardiac amyloidosis.

CH148-ED-X

Pulmonary Hypertension and Current WHO Classification: Can We made a Specific Diagnosis using CT and MRI?

All Day Room: CH Community, Learning Center

Participants

Carlos Gustavo Y. Verrastro, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Jose E. Barroso Junior, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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Roberta P. Ramos, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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Angelo Xerez C. Fonseca, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Nitamar Abdala, MD, PhD, Mogi Das Cruzes, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Show CT and MRI findings that may help radiologists with the diagnosis of specific causes of pulmonary hypertension. Illustrate different causes of PH according to the current classification of the disease. Show some rare differential diagnosis as a cause of PH, dilatation of pulmonary arteries and pulmonary arteries filling defects.

TABLE OF CONTENTS/OUTLINE

Definition and classification: Pulmonary hypertension (PH) is a condition where pulmonary arterial pressure is elevated above 25mmHg at rest measured by right heart catheterization.Clinical manifestations are nonspecific and most patients complains of exertional dyspnea, fatigue and chest pain.Imaging tests play a fundamental role in diagnosis.Current classification comprises 5 groups:*group1* pulmonary arterial hypertension;*group2* PH due to left heart disease:*group3* PH due to lung disease and/or hypoxia;*group4* Chronic Thromboembolic disease and other pulmonary artery obstructions;*group5* PH with unclear and/or multifactorial mechanisms.**Imaging:**CT and MRI signs of PH are well known and are common to all groups. Our purpose is to show ancillary CT and MRI findings that may help radiologists with the diagnosis of specific causes of PH according to the current classification of the disease. **Conclusion:**More than depict the morphological features of PH CT and MRI can sometimes make an specific diagnosis.

CH150-ED-X

Infectious Respiratory Emergencies: HRCT Findings and Differential Diagnosis

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Cum Laude

Participants
Tomas C. Franquet, MD, Barcelona, Spain (*Presenter*) Nothing to Disclose
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Gustavo S. Meirelles, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Partner, DICOM Grid; Stockholder, Fleury SA; Advisory Board, Boehringer Ingelheim GmbH; Advisor, F. Hoffmann-La Roche Ltd

TEACHING POINTS

Review HRCT manifestations of life-threatening lung infections Correlate imaging findings with clinical and histologic features Provide a framework for formulating a differential diagnosis

TABLE OF CONTENTS/OUTLINE

Infection is the most common lung disease and the third leading cause of death in the USA, after ischemic heart and cerebrovascular diseases. Infectious respiratory emergencies produce significant morbidity and mortality and often require treatment in the Intensive Care Unit. Diagnosis relies on correlation of clinical and imaging findings. This exhibit will review and illustrate the HRCT manifestations of various life-threatening lung infections.**Vascular**Infarction and hemorrhage (“Halo sign”)Septic embolism and hemorrhage (“Halo sign”): Fungi (Aspergillus, Mucor, Histoplasma); Viruses (Herpes)
Aneurysm (Rasmussen)**Non-vascular** Acute necrotizing pneumonia
Aspiration pneumonia and lung abscess
Pulmonary gangrene
Diffuse pulmonary hemorrhage: Dengue, Leptospira (Weil’ syndrome)
Bronchopleural fistula and empyema
Acute respiratory distress syndrome (ARDS)Infectious respiratory emergencies vary with the specific causative microorganism and the patient’s immune status. Recognition of specific imaging features allows the formulation of a focused differential diagnosis and impacts management.

Honored Educators

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Melissa L. Rosado De Christenson, MD - 2012 Honored Educator
Santiago Martinez-Jimenez, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2015 Honored Educator

CH151-ED-X

Solitary Fibrous Tumors of the Thorax: Looking Beyond the Pleura

All Day Room: CH Community, Learning Center

Participants
Jose Luis Lerma Gallardo, MD, Madrid, Spain (*Presenter*) Nothing to Disclose
Juan Carlos Monte Gonzalez, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Ana Bustos, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Beatriz Cabeza, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Lourdes Estrada Munoz, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Joaquin D. Ferreiros, MD, PhD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To illustrate the imaging features of pleural and extrapleural solitary fibrous tumors (SFT) of the thorax2. To highlight pathologic features with gross or histologic specimens3. To summarize the differential diagnoses of SFT of the thorax

TABLE OF CONTENTS/OUTLINE

-Classification of STF of the thorax by site of origin Pleural Mediastinal Intrapulmonary Chest wall Breast-Clinical manifestations of SFT of the thorax Asymptomatic (patients with small neoplasms) Symptomatic (local or systemic complaints) Paraneoplastic syndromes-Review of multimodality imaging features of SFT of the thorax Chest radiography / mammography US CT MRI PET-CT Angiography-Differential diagnosis of SFT of the thorax Pleural: pleural metastases, mesothelioma, lymphoma Mediastinal: thymoma, pericardial mesothelioma, lymph nodal mass, lymphoma, neurogenic tumors Intrapulmonary: carcinoid, hamartoma, bronchogenic carcinoma and other causes of solitary pulmonary nodules Chest wall: malignant fibrous histiocytoma, leiomyosarcoma, alveolar soft-part sarcoma, angiosarcoma, PNET, neurogenic tumors, solitary vascular metastatic lesion Breast: phyllodes tumor, mucinous carcinoma, ductal invasive carcinoma-Describe gross features and histologic characteristics of SFT-Management of SFT of the thorax

CH152-ED-X

An Overview of Pulmonary Mycosis: Revisiting Pathogenesis and Cross Sectional Imaging Findings

All Day Room: CH Community, Learning Center

Participants

Ameya J. Baxi, MBBS, DMRD, San Antonio, TX (*Presenter*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Daniel Ocazionez, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Daniel Vargas, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Study different fungi that affect lungs • Discuss the role of imaging in the diagnosis and evaluation of pulmonary mycosis and their complications • Differentiate pulmonary mycoses from diseases having similar radiological appearances

TABLE OF CONTENTS/OUTLINE

The incidence of fungal respiratory tract infections is increasing, due to excess use of antibiotics, corticosteroids, and organ transplantation and rise in HIV cases. Though multiple systems are affected, pulmonary complications are associated with significant morbidity & mortality. It is important for radiologists to be aware of various radiological manifestations of pulmonary mycosis as they closely mimic that of other infections (bacterial, viral), inflammatory processes & malignancies.The radiological manifestations of pulmonary mycosis are varied and include consolidation, calcified and non-calcified multiple pulmonary nodules, cavitary lesions, reticulonodular opacities, ground glass opacity, interlobular septal thickening, air crescent sign, spectrum of hypersensitivity pneumonitis, hilar adenopathy and pleural effusion. In this exhibit we will discuss the most common radiological appearance of pulmonary mycoses on plain radiography, CT scan and MRI. A high degree of suspicion coupled with relevant patient history can have significant impact on diagnosis & patient care.

Honored Educators

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator

CH153-ED-X

Lung-RADS™: Pushing the Limits

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
Maria D. Martin, MD, Madison, WI (*Presenter*) Nothing to Disclose
Jeffrey P. Kanne, MD, Madison, WI (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation; Advisory Board, F. Hoffmann-La Roche Ltd
Lynn S. Broderick, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Ella A. Kazerooni, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Cristopher A. Meyer, MD, Madison, WI (*Abstract Co-Author*) Stockholder, Cellectar Biosciences, Inc Investor, NeuWave, Inc

TEACHING POINTS

Lung-RADS guidelines are a first iteration and questions have arisen in clinical practice Illustrate these questions with clinical cases and propose solutions to ambiguities in the classification and management of findings

TABLE OF CONTENTS/OUTLINE

Background on development of Lung-RADS Show cases illustrating ambiguities in the classification and management of findings in Lung-RADS How to manage individuals ageing out of screening Lung-RADS vs. Fleischner Society guidelines for managing nodules Managing a large nodule with slow growth based on prior study: volume doubling time concept Pure ground-glass nodules (GGN): Slow growth is not defined Growth definition should also address increase in density Possible modifier in category 2 to address persistent > 2 cm GGN that are slowly growing Managing airway lesions and mucus plugs or retained secretions Cavitary nodule measurement and management Nodules consistent with intrapulmonary lymph nodes S modifier management options Patients with prior non-lung malignancy Screening vs. diagnostic CT in eligible patients with nonspecific symptoms How to classify nodules that look like metastasis or infection, such as nodules of varying sizes and tree-in-bud nodules Propose possible solutions to each scenario based on our collective experience

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Jeffrey P. Kanne, MD - 2012 Honored Educator
Jeffrey P. Kanne, MD - 2013 Honored Educator
Ella A. Kazerooni, MD - 2014 Honored Educator

CH154-ED-X

Beyond the Granuloma: Imaging Manifestations of Thoracic Histoplasmosis

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Daniel Alvarez, MD, Santiago, Chile (*Presenter*) Nothing to Disclose
Tami J. Bang, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Daniel Ocazionez, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Francisca Leiter, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Daniel Vargas, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to:1. Review the epidemiology, geographic distribution and pathophysiology of histoplasmosis2. Discuss the different manifestations of the disease3. Familiarize the radiologist with the imaging findings of the disease, complications and differential diagnoses

TABLE OF CONTENTS/OUTLINE

1. Review of thoracic histoplasmosis Epidemiology Geographic distribution Pathophysiology2. Classic histoplasmoma3. Acute histoplasmosis4. Disseminated histoplasmosis5. Chronic cavitary histoplasmosis6. Fibrosing Mediastinitis7. Differential diagnoses

Honored Educators

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Carlos S. Restrepo, MD - 2014 Honored Educator

CH155-ED-X

Understanding 'Category S' in Lung Cancer Screening CT: What Lesions Are Clinically Significant?

All Day Room: CH Community, Learning Center

Participants
Brandon Bachert, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Igor Goykhman, DO, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Reilly Jr, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Hongju Son, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Understand the primary goals of lung cancer screening CT and the ACR Lung-RADS classification system which allows for standardized reporting and recommendations to manage suspicious lesion. The lung-RADS Category S modifier is used for potentially clinically significant findings which are not lung cancer. The potential advantages of identifying Category S findings include the opportunity to screen for other smoking-related illness, cardiovascular disease, respiratory illness or other neoplasm which might cause significant mortality and morbidity. Standardized reporting and appropriate management of Category S findings decrease risks and costs related to investigation of benign conditions.

TABLE OF CONTENTS/OUTLINE

Background Review goals for low dose CT lung cancer screening Review ACR Lung-RADS classification Define Category S incidental findings Examples of common and uncommon Category S findings Cardiovascular disease Respiratory illness Neoplasm Other uncommon abnormalities Guidelines and management of Category S findings

CH156-ED-X

CT Examination as a Screening for Pneumoconiosis: Is Chest Radiograph Truly Enough to Evaluate Individuals with Occupational Dust Exposure?

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants

Hideyuki Hayashi, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Kazuto Ashizawa, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masashi Takahashi, MD, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Katsuya Kato, MD, Okayama, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroaki Arakawa, MD, Shimotsuga-gun, Japan (*Abstract Co-Author*) Nothing to Disclose
Takumi Kishimoto, Okayama, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshihiro Otsuka, I?ami-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Sumihisa Honda, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Satoshi Noma, MD, PhD, Tenri, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Teaching pointsThe major teaching points of this exhibit are:1. To know the limitation of chest radiograph in the evaluation of early pneumoconiosis.2. To know the advantage of CT examination in the evaluation of early pneumoconiosis3. To represent the false positive and false negative cases on chest radiograph.

TABLE OF CONTENTS/OUTLINE

1. Introduction2. Current status of a screening for pneumoconiosis in Japan3. Limitation of chest radiograph in the evaluation of early pneumoconiosisA) Observer performance by enough experienced chest radiologists or pulmonologistB) Review of CT findings associated with scoring of chest radiograph4. Advantage of CT examination in the evaluation of early pneumoconiosisA) Showing of representative casesB) CT findings affect on the evaluation of chest radiograph5. Conclusion

CH157-ED-X

Imaging Immunotherapy in Lung Cancer-Unique Challenges

All Day Room: CH Community, Learning Center

Participants
Mark M. Hammer, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Sharyn I. Katz, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Stephen Bagley, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Explain the concept behind immunotherapy and why responses are delayed and can appear paradoxical. List different patterns of treatment responses that can be observed with immunotherapy. Describe imaging findings of potential side effects of immunotherapy.

TABLE OF CONTENTS/OUTLINE

Overview of Immunotherapy Motivation and underlying concept Indications in lung cancer Response Assessment Timing and patterns of response Clinical response assessment Immune-related response criteria (irRC) Immune-related Side Effects Pneumonitis Other: colitis, hypophysitis, etc.

CH158-ED-X

Chronic Pulmonary Aspergillosis: Imaging Patterns

All Day Room: CH Community, Learning Center

Participants
Ramon M. Santos, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Carlos G. Verrastro, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Israel Missrie, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Maria D. Bergamasco, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Arnaldo L. Colombo, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Gilberto Szarf, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Henrique M. Lederman, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Gustavo S. Meirelles, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Partner, DICOM Grid; Stockholder, Fleury SA; Advisory Board, Boehringer Ingelheim GmbH; Advisor, F. Hoffmann-La Roche Ltd
Edson Marchiori, MD, PhD, Rio de Janeiro, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review the pathophysiology of Chronic Pulmonary Aspergillosis (CPA).2. To characterize the imaging presentations of CPA.

TABLE OF CONTENTS/OUTLINE

Pathophysiology of CPA.Bronchopulmonary aspergillosis is caused by the inhalation of spores from Aspergillus spp. The spectrum of disease is largely determined by the integrity of the lung as well as the innate and adaptive immune responses of the individual to the inhalation of the fungal spores. Chronic pulmonary aspergillosis (CPA) is a chronic lung infection that occurs in patients with no or mild immunodepression, which often present previous pulmonary injuries. Diagnosis Approach and classification of CPA.The diagnosis of CPA relies on at least 3-months of symptoms with clinical symptoms, imaging studies, antibody/antigen testing and mycological evidence.The following involvement patterns are related to CPA: pulmonary nodule, aspergilloma, chronic cavitary pulmonary aspergillosis (CCPA), chronic fibrosing pulmonary aspergillosis (CFPA) and chronic necrotizing pulmonary aspergillosis (CNPA). Imaging findings and cases of CPA.All CPA subtypes descripted above were exemplified in the presentation.

CH159-ED-X

Not Quite Incidental: Adult Congenital Heart Disease Discovered on CT of the Chest

All Day Room: CH Community, Learning Center

Participants

Nagina Malguria, MBBS, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Mina F. Hanna, MBBCh, MSc, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Cheng Ting Lin, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Amira F. Hussien, MBBCh, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose
Elliot K. Fishman, MD, Baltimore, MD (*Abstract Co-Author*) Institutional Grant support, Siemens AG; Institutional Grant support, General Electric Company;
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

TEACHING POINTS

1. With refinement of surgical techniques for congenital heart disease, patients operated for complex congenital heart disaese are surviving into adulthood. These patients present to the ED and often get a chest CT. 2. Current generation CT scanners allow detailed visualization of anatomy in operated and operated patients. 2. A systemic approach allows appropriate delineation of abnormalities

TABLE OF CONTENTS/OUTLINE

1.Analysis of cardiac structures Situs (location of heart in the chest): solitus, inversus, ambigus Atria: Utilizing the appendage anatomy for laterality. Ventricles: Moderator band and infundibulum for the right ventricle. Great Vessels: Identifying by branching pattern, relationship to ventricles and to each other. Other Vessels: Superior Venacava(e). Azygous and homozygous systems. Coronary arteries: Origin, course and termination 2.Lungs. Bronchial branching pattern, sequestration, pulmonary vascular malformations. 3.Upper abdomen. Sidedness and location of liver and spleen. Inferiovenacava:sidedness and continuity. 4.Previously operated patient. Conduits, patches or baffles (may be calcified). Aortic root aneurysms and dilatations. Pulmonary artery main or branch vessel stenosis. Configuration of right ventricular outflow tract. Prosthetic valves. Specific appearances of important procedures.Fontan and its complications.

Honored Educators

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Elliot K. Fishman, MD - 2016 Honored Educator
Suhny Abbara, MD - 2014 Honored Educator

CH160-ED-X

Uncommon Complications of Aortic Dissection and Its Related Diseases: A Pictorial Review

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Eijun Sueyoshi, MD, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Ichiro Sakamoto, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:1. To know the various CT findings of uncommen complications of aortic dissection and its reated diseases.2. To know the clinical significances of CT imaging findings of uncommen complications of aortic dissection and its reated diseases.3. To know the clinical significances of uncommen complications of aortic dissection and its reated diseases.

TABLE OF CONTENTS/OUTLINE

1. Explanation of CT findings and clinical significances of uncommen complications of aortic dissection and its reated diseases.2. Illustrative cases- Presentation of various CT findings of uncommen complications of aortic dissection and its reated diseases.- Presentation of CT findings of serial changes of uncommen complications of aortic dissection and its reated diseases.3. Discussion4. Directions and summary

CH161-ED-X

The Evolution of Viruses: Can We Identify Emerging Viral Pneumonia?

All Day Room: CH Community, Learning Center

Awards
Identified for RadioGraphics

Participants
Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Kyung-Hyun Do, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Ho Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review the new members of viruses which have raised concerns with outbreak of viral pneumonia, including severe acute respiratory syndrome coronavirus (SARS-CoV) or Middle East respiratory syndrome corona virus (MERS- CoV) epidemic and influenza A (H1N1) pandemic 2. To identify characteristic patterns of viral pneumoinas depending on the pathogens using CT3. To learn the clinical characteristics such as age, immune status, seasonal variation, and community outbreaks periods which are also important factors in diagnosisIn this exhibition, we will thoroughly review the various viral pneumonias with their clinical and radiologic findings.

TABLE OF CONTENTS/OUTLINE

Introduction
- Microbiologic evaluation methods
- Viral pneumonias in patients who requiring intensive care unit admission

Various Viral Pneumonias
1) Influenza viruses
   - Influenza A (H1N1)
   - Avian influenza A (H7N9)
   - Influenza B2) Human metapneumovirus 3) Coronavirus
   - Severe Acure Respiratory Syndorme (SARS)-CoV
   - Middle East Respiratory Syndrome (MERS)-CoV4) Adenovirus
5) Respiratory syncytial virus
6) Enterovirus
7) Herpes simplex virus
8) Papilloma virus
9) Varicella-zoster virus
10) Cytomegalovirus
11) Epstein-Barr virus
12) Hantavirus

CH162-ED-X

Enhancement of False Lumen in Aortic Intramural Hematoma (IMH)

All Day Room: CH Community, Learning Center

Participants
Eijun Sueyoshi, MD, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Ichiro Sakamoto, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To know the various pattern of enhancement of false lumen in IMH2. To know the clinical significances of enhancement of false lumen in IMH3. To know the serial changes of enhancement of false lumen in IMH4. To know the therapeutic strategy based on enhancement of false lumen in IMH

TABLE OF CONTENTS/OUTLINE

1. Explanation of CT findings and clinical significances of enhancement of false lumen in IMH2. Illustrative cases- Presentation of CT findings and clinical significances of enhancement of false lumen in IMH- Presentation of CT findings of serial changes and complications of false lumen in IMH3. Discussion4. Directions and summary

CH163-ED-X

Radiopathologic Correlation of Idiopathic Interstitial Pneumonias: The Importance of a Combined Diagnostic

All Day Room: CH Community, Learning Center

Participants
Maria Esther Gomez San Martin, MD, Valladolid, Spain (*Presenter*) Nothing to Disclose
Maria Rosa Lopez-Pedreira, MD, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose
Pilar Carton, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose
Laura Casadiego Matarranz, MD, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose
Teresa Alvarez de Eulate Garcia, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose
Ana Gil-Guerra, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

-To review the current classification of idiopathic interstitial pneumonias (IIP), created and revised by the American Thoracic Society and the European Respiratory Society (2013).
-To show HRCT characteristic findings of each entity, and highlight the importance that correct diagnosis of IIPs can be achieved only by means of interdisciplinary consensus between radiologist, pulmonologist and pathologist, and stringent correlation of clinical, imaging, and pathologic findings.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in a quiz format. We will show in this study HRCT characteristic findings of each entity with its histological correlation. Key differential diagnostic points will be highlighted in the discussion of each case, wih examples all of them.The list of cases includes:***1. Main idiopathic interstitial pneumonia:***• idiopathic pulmonary fibrosis/ usual interstitial pneumonia (IPF / UIP)• nonspecific interstitial pneumonia(NSIP)• respiratory bronchiolitis–associated interstitial lung disease (RB-ILD)• desquamative interstitial pneumonia (DIP)• cryptogenic organizing pneumonia (COP)• acute interstitial pneumonia (AIP).***2.Rare idiopathic interstitial pneumonias:***• lymphoid interstitial pneumonia(LIP)• pleuropulmonary fibroelastosis (PPFE)***3. Idiopathic interstitial pneumonias not classifiable ****

CH164-ED-X

Anthracofibrosis-A Lung Cancer Mimic: Imaging features on CT with Bronchoscopy Correlation

All Day Room: CH Community, Learning Center

Participants
Anandamoyee Dhar, New Delhi, India (*Presenter*) Nothing to Disclose
Bharat Aggarwal, MBBS, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Ajay Lall, MBBS, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Imaging features of Anthracofibrosis – smooth bronchostenosis, peribronchial soft tissue thickening, subsegmental atelectasis, lymph node enlargement, appearing as malignancy or tuberculosis on CT.2.Correlation with bronchoscopy - distorted, stenosed or inflammed bronchi with varied severity of pigmentation which bleed profusely on biopsy.4. Histopathology - inflammatory cells with anthracotic pigmentation involving mucosa or lymph node.5. Anthracofibrosis is often missed yet important diagnosis in patients with chronic respiratory complaints.6. Rarely anthracofibrosis is recognized and reported on chest CT, and usually misdiagnosed as bronchogenic carcinoma.2.Differentiating features with other common pathologies like tuberculosis, sarcoidosis, bronchogenic carcinoma and pneumoconiosis.

TABLE OF CONTENTS/OUTLINE

1. Introduction- Anthracofibrosis is an inflammatory bronchial stenosis with overlying anthracotic mucosa.2. Clinical features, incidence and etiopathogenesis.3. Bronchoscopy and histopathology findings.5. Relationship with tuberculosis and Key differentiating features from endobronchial TB and bronchogenic carcinoma, sarcoidosis,pneumoconiosis.6. Sample cases illustrating the imaging features on chest xray, CT Thorax and bronchoscopy.8. Summary and take home message

CH165-ED-X

Thoracic Fungal Infection Revisited: How to Differentiate in a New Therapeutic Era

All Day Room: CH Community, Learning Center

Participants

Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Mi Young Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung-Han Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To learn the clinical characteristics including patients' immnue status, transplantation or hematologic malignancy conditions and the risks of thoracic fungal infection2. To demonstrate suggestive CT findings of thoracic fugal infections using various cases focusing on the specific CT signs such as halo sign, reversed halo sign and bird's nest sign3. To find differential points by comparing other pathogens which could mimic fungal infections

TABLE OF CONTENTS/OUTLINE

1. Introduction
- Immunity and fungal infection
: Opportunistic fungal infection in immunocompromised patients**2. The role of chest CT to diagnose fungal infection**

3. Diagnosis and treatment of thoracic fungal infection 1) Aspergillus
- Aspergilloma
- Allergic bronchopulmonary aspergillosis
- Semi-invasive aspergillosis
- Airway invasive aspergillosis
- Angioinvasive aspergillosis 2) Zygomycetes including Mucormycosis 3) Cryptococcus: focal vs. disseminated 4) Pneumocystis jirovecii 5) Candida 6) Others**4. Mimickers**
- Invasice pulmonary aspergillosis-mimicking tuberculosis

CH166-ED-X

Extraosseous Multiple Myeloma in the Chest

All Day Room: CH Community, Learning Center

Participants

Berthina B. Coleman, MD, Seattle, WA (*Presenter*) Nothing to Disclose
Jitesh Ahuja, MD, MBBS, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
J. D. Godwin, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Sudhakar N. Pipavath, MD, Mercer Island, WA (*Abstract Co-Author*) Consultant, Boehringer Ingelheim GmbH; Advisor, Boehringer Ingelheim GmbH; Speaker, Boehringer Ingelheim GmbH
Gautham P. Reddy, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Illustrate radiologic pattern of thoracic involvement in multiple myeloma beyond bone lesions2. Radiologic-pathologic correlation of thoracic multiple myeloma

TABLE OF CONTENTS/OUTLINE

Malignant myeloma (MM) is a monoclonal proliferation of neoplastic plasma cells causing multiple osteolytic lesions. Myeloma is usually confined to bone or to the tissues immediately surrounding bone. Collections of plasma cells are called plasmacytomas. Although myeloma often affects bones of the thorax, it is seldom found away from the bones of the thorax. In this educational exhibit we show 12 cases of thoracic myeloma, emphasizing extraosseous manifestations. Lung involvement includes solitary or multiple nodules, miliary nodules, and intravascular nodules. Extraosseous plasmacytomas of the airway, pleura, mediastinum, skin, breast, chest wall, and lymph nodes will also be shown. Radiologists encountering an extraosseous tumor in the setting of myeloma should be alert to the possibility of extraosseous myeloma.

Honored Educators

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J. D. Godwin, MD - 2013 Honored Educator
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Sudhakar N. Pipavath, MD - 2015 Honored Educator
Gautham P. Reddy, MD - 2014 Honored Educator

CH167-ED-X

Pulmonary Vascular Organization: Normal and Abnormal

All Day Room: CH Community, Learning Center

Participants
Kevin C. He, MD, Rochester, NY (*Presenter*) Nothing to Disclose
Thomas Marini, East Syracuse, NY (*Abstract Co-Author*) Nothing to Disclose
Amit B. Desai, MD, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose
Daniel C. Oppenheimer, MD, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose
Susan K. Hobbs, MD, PhD, Pittsford, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:1. To review the normal anatomy of the pulmonary vasculature, including discussion of the pulmonary arteries, pulmonary veins, and bronchial arteries. This will include organization of the segmental pulmonary arteries using a system similar to Boyden's nomenclature for tracheobronchial anatomy.2. To describe a patterned approach to Computed Tomography interpretation.3. Utilizing the above foundations, congenital anomalies and variants will be used to illustrate the utility of the pattern-based approach.

TABLE OF CONTENTS/OUTLINE

1. Review of normal anatomy:- Normal pulmonary artery configuration and nomenclature.- Pulmonary veins - brief discussion on embryology.- Primary vs. secondary pulmonary circulations.- Pulmonary collaterals.2. Congenital pulmonary arterial variants (examples include):- Proximal interruption/atresia.- Anomalous origin of the left pulmonary artery (sling).- Idiopathic dilatation of the pulmonary trunk.- Pulmonary sequestration (intra- and extralobar).3. Congenital pulmonary venous variants (examples include):- Total Anomalous Pulmonary Venous Return (TAPVR).- Partial Anomalous Pulmonary Venous Return (PAPVR, including Scimitar syndrome).- Pulmonary arteriovenous malformation (pulmonary AVM).

CH168-ED-X

Multimodality Imaging of Prevascular Mediastinal Masses: Primer and Persistent Pitfalls

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants

Naveen Sharma, MRCP, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Alexia Farrugia, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rebecca Preston, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Zaid N. Viney, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Teresa A. Szyszko, MBBS, MSc, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gary Cook, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Research support, General Electric Company; Research support, Alliance Medical Limited; Research support, Siemens AG; Research Consultant, Blue Earth Diagnostics Ltd; Speakers Bureau, Bayer AG
Emma Mclean, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rohit Lal, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Juliet King, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Arjun Nair, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Andrea Bille, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The viewer should be able to: Become familiar with the modern definition of mediastinal compartments Understand the complementary advantages and limitations of CT, MRI and PET-CT in the diagnosis of prevascular (anterior) mediastinal masses Have an understanding of the imaging features that dictate (a) the decision to proceed to percutaneous or surgical biopsy, and (b) choice of surgical technique Be aware of techniques to tailor imaging acquisition to maximise information regarding anatomical relationships of these masses

TABLE OF CONTENTS/OUTLINE

Overview of traditional (e.g. Fraser and Pare, Felson, Heitzman, Zylak, and Whitten models) and modern ITMIG 3-compartment models Case-based review of common prevascular/ "anterior" mediastinal masses: thymic epithelial tumours, germ cell tumours, lymphoma Differentiating between the different benign and malignant prevascular mediastinal lesions on CT, MRI and PET-CT Strengths and weaknesses of each modality- rationalising imaging strategy Recommended minimum dataset for reporting masses suspicious for thymoma, as per ITMIG CT Imaging Kit, using examples Factors influencing decision to proceed to percutaneous imaging biopsy or direct resection Tailored imaging to guide preoperative planning e.g. ECG-gated cardiac CT to explore relationship of masses to coronary vessels

CH170-ED-X

Pulmonary and Cardiac Storage Diseases in Adults: Spectrum of Imaging Features with Histopathological Correlation

All Day Room: CH Community, Learning Center

Participants

Monika Arzanauskaite, London, United Kingdom (*Presenter*) Nothing to Disclose
Tomas C. Franquet, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Kyung S. Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joungho Han, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Raad Mohiaddin, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. To explain the utility of imaging modalities and suggest study protocols. 2. To review the imaging appearances of pulmonary and myocardial storage diseases. 3. To correlate the imaging findings with the histopathologic features.

TABLE OF CONTENTS/OUTLINE

Pulmonary and cardiac storage diseases can be broadly defined as a haematogenous accumulation of abnormal materials within the tissues. The spectrum of storage diseases is wide - in secondary metabolic conditions such as amyloidosis they occur due to renal failure; they can also be inherited in genetic conditions such as lysosomal storage disorders. HRCT and CMR may show highly suggestive imaging features and thus aid to early diagnosis and treatment evaluation. This exhibit will provide a structured case-based review of storage diseases by correlating imaging and histopathologic findings.1. Pulmonary and cardiac storage diseases. Genetic: Lipid storage, Glycogen storage, Hermansky-Pudlak syndrome (HPS1), Lysinuric protein intolerance. Metabolic: Pulmonary and cardiac amyloidosis, Pulmonary alveolar proteinosis, Pulmonary and cardiac haemosiderosis, Amiodarone toxicity of the lung. Pulmonary calcification or ossification. 2. Suggested imaging protocols: CMR, CT.3. Case-based review of imaging findings. 4. Differential diagnosis.

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CH174-ED-X

High-resolution CT Findings of Viral Pneumonias: What Radiologists Should Know

All Day Room: CH Community, Learning Center

Participants
Yoshie Kunihiro, MD, Ube, Japan (*Presenter*) Nothing to Disclose
Nobuyuki Tanaka, MD, Ube, Japan (*Abstract Co-Author*) Nothing to Disclose
Tsuneo Matsumoto, MD, Ube, Japan (*Abstract Co-Author*) Nothing to Disclose
Taiga Kobayashi, Ube, Japan (*Abstract Co-Author*) Nothing to Disclose
Naofumi Matsunaga, MD, PhD, Ube, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:To explain the common pathologic and high-resolution CT (HRCT) findings of viral pneumoniaTo review the HRCT findings of various viral pneumoniasTo discuss the differential diagnosis of viral pneumonia

TABLE OF CONTENTS/OUTLINE

Pathogens of viral pneumoniaCommon pathologic findings of viral pneumoniaCommon HRCT findings of viral pneumoniaReview of imaging findings- HRCTSample casesDifferential diagnosis

CH175-ED-X

Established and Novel Imaging Assessment for Malignant Pleural Mesothelioma: from Diagnosis to Response Evaluation in the Era of Molecular Imaging

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants

Alexia Farrugia, MD, London, United Kingdom (*Presenter*) Nothing to Disclose
Naveen Sharma, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Lukacs Veres, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rebecca Preston, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Arjun Nair, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Teresa A. Szyszko, MBBS, MSc, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gary Cook, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Research support, General Electric Company; Research support, Alliance Medical Limited; Research support, Siemens AG; Research Consultant, Blue Earth Diagnostics Ltd; Speakers Bureau, Bayer AG
Vicky J. Goh, MBBCh, London, United Kingdom (*Abstract Co-Author*) Research Grant, Siemens AG Speaker, Siemens AG
Zaid N. Viney, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The viewer should be able to:1. Understand the typical and non-typical of malignant mesothelioma2. Become aware of patterns of spread to guide review of crucial areas on imaging2. Appropriately utilise modified response assessment in malignant mesothelioma in the context of clinical trials and clinical practice3. Develop an awareness of emerging techniques used to stage and assess metabolic response such as FLT-PET and MR-PET

TABLE OF CONTENTS/OUTLINE

CT and PET-CT appearances of malignant mesothelioma: initial diagnosis, typical and atypical patterns of spread, essential review areas Updated TNM staging of malignant mesothelioma Modified RECIST criteria utilisation: background of RECIST criteria, identifying target and non-target lesions, appropriate unidimensional measurement Molecular imaging: established FDG PET-CT metrics, as well as emerging techniques such as FLT-PET and MR-PET in response assessment Recommended reporting strategy for different modalities

CH176-ED-X

Lung Cancer-Treatment Response vs Local Recurrence on Chest CT

All Day Room: CH Community, Learning Center

Participants
Asha Kandathil, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Kiran Batra, MD, Coppell, TX (*Abstract Co-Author*) Nothing to Disclose
Jacqueline T. Caire, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Sachin S. Saboo, MD, FRCR, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Michael J. Landay, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
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

TEACHING POINTS

The purpose of this exhibit is:1. To review current therapeutic options in management of patients with lung cancer2. To discuss patterns of therapeutic response and local recurrence of lung cancer on surveillance chest CT, which will vary with treatment modality employed.3. To illustrate the importance of comparison with prior studies including PET/CT scans and radiotherapy planning scans to detect subtle changes that indicate disease progression.

TABLE OF CONTENTS/OUTLINE

1. Current therapeutic options for patients with lung cancer.2. Response assesment on surveillance chest CT in post-surgical patients3. Expected appearance of post ablation zone in those patients treated with radiofrequency ablation and imaging features suggestive of partial ablation or tumor recurrence.3. Timeline and patterns of lung abnormalities after stereotactic body radiotherapy (SBRT) and clues aiding early detection of post SBRT tumor recurrence.4. Assessment of tumor response to chemotherapy, molecular therapies and angiogenesis inhibitors on chest CT.

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Suhny Abbara, MD - 2014 Honored Educator

CH177-ED-X

Connective Tissue Disorders: Case-Based Approach

All Day Room: CH Community, Learning Center

Participants

Maria V. Ramos, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Joaquina Paz Lopez Moras, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lucrecia Micheli, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1.Review most common cardiothoracic findings in connective tissue disease (CTD)2.Review patterns of pulmonary involvement3.Recognize diagnostic clues that may suggest diagnosis of CTD

TABLE OF CONTENTS/OUTLINE

A.Rheumatoid arthritisa.Pleural- Pericardialb.Interstitial- UIP, NSIP, OPc.Bronchial abnormalitiesi.Bronchitis, bronchiectasisii.Constrictive bronchiolitisiii.Follicular bronchiolitisd.NodulesB.Sclerodermaa.Interstitial-NSIPb.Esophageal dysmotilityc.Pulmonary hypertensiond.Other associationsC.Systemic lupus erythematousa.Serositis (Pleural/ pericardial)b.Pnuemonia, edema, hemorrhage, acute lupus pneumonitisc.Shrinking lung syndromeD.Polymiositis / Dermatomyositisa.Interstital- NSIP, OPb.Secondary manifestationsE.Sjogren´s syndromea.Interstitial- NSIP, UIP, LIPb.Bronchiectasis, follicular bronchiolitisc.Pulmonary hypertensiond.Associations (lymphoma)F.Mixed connective tissue disorderG.Interstitial pneumonia with autoimmune features (IPAF)

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Santiago E. Rossi, MD - 2015 Honored Educator
Sanjeev Bhalla, MD - 2014 Honored Educator
Sanjeev Bhalla, MD - 2016 Honored Educator

CH179-ED-X

Multimodality Imaging in Aortitis: Where the Radiologist Needs to Look Besides the Aorta

All Day Room: CH Community, Learning Center

Participants
Lucia Fernandez Rodriguez, BMBS, Madrid, Spain (*Presenter*) Nothing to Disclose
Inmaculada Pinilla Fernandez, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Alfonso Martin Diaz, BMedSc, San Sebastian De Los Reyes, Spain (*Abstract Co-Author*) Nothing to Disclose
Alicia L. Beltran, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Juan Jose Rios, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Isabel Torres Sanchez, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1.Review the conditions that most frequently cause aortitis,and describe its most relevant radiologic findings. 2.Review the alterations that are associated with it, which may help inform its diagnosis and etiology.

TABLE OF CONTENTS/OUTLINE

Aortitis is a nonspecific term that involves a pathology characterized by inflammation and structural alteration of the aortic wall. Their clinical manifestations are often vague, and imaging studies (especially CT and MR but also PET) are crucial for its diagnosis and follow-up. We classified aortitis into two categories: noninfectious and infectious. Noninfectious etiologies include rheumatic diseases, idiopathic and iatrogenic conditions. Thickening of the aortic wall, stenosis and vascular occlusion, mural contrast enhancement, peri-aortic soft tissue density, intramural gas, aneurysm, calcifications and mural thrombus are findings that suggest aortic inflammatory pathology. However, it is also important to consider other structures that may be affected (the mediastinum, the lungs, pulmonary arteries, coronary arteries, mesenteric arteries..) that can help confirm the diagnosis and etiology of this entity, often otherwise unsuspected by the clinician.

CH180-ED-X

The Post-Op Breast on the Chest: Recognizing and Describing Common Cosmetic and Oncologic Breast Procedures as Demonstrated by Chest CT

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
Clinton E. Jokerst, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose
Hannah A. Lawther, MD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Daniel Vargas, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Barbara A. Pockaj, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose
Bhavika K. Patel, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

After reviewing this exhibit, participants will be able to:1) Describe the cosmetic and oncologic procedures most commonly employed by breast surgeons2) Identify and distinguish between breast procedures based on their CT appearance3) Recognize the CT findings of common post-operative complications

TABLE OF CONTENTS/OUTLINE

IntroductionTrends in Cosmetic and Oncologic Breast ProceduresBrief description of Surgical Technique with DiagramsCT cases including (but not limited to): -Breast conservation therapy (BCT) -Mastectomy -Autologous Tissue Flaps (both Free and Pedicled) -Implant ReconstructionCT cases demonstrating common post-operative complications: -Acute: hematoma/seroma, infection, hypertrophic scarring, wound dehiscence -Late: capsular contracture, implant deflation or rupture, contour irregularity, anaplastic large cell lymphoma. Conclusions

CH181-ED-X

Pneumothorax in the Supine Patient: Can You Recognize it?

All Day Room: CH Community, Learning Center

Participants
Ane Ugarte Nuno, MBBS, San Sebastian, Spain (*Presenter*) Nothing to Disclose
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Mikel Mendoza Alonso, San Sebastian, Spain (*Abstract Co-Author*) Nothing to Disclose
Ainhoa Galardi Mendiluze, San Sebastian, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Knowledge of the radiographic signs of pneumothorax in the supine patient is fundamental to the care of critically ill patients. However, these signs remain to be a challenge for radiologists. In the presentation we will review them through a pictorial review in a quiz format.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in a quiz format. Key differential diagnostic points will be highlighted in the discussion of each case. The list of cases includes:1. Radiographic anatomy of pneumothoraces : Anteromedial Subpulmonic Apicolateral Posteromedial 2. Recognition of the classic signs: Deep sulcus sign Sharp delineation of vascular structures Deep anterior cardiophrenic sulcus Hyperlucent upper quadrant of the abdomen Sharp diaphragmatic outline Hyperlucency of an hemithorax

CH182-ED-X

Imaging Review of Esophageal Injuries, Etiologies, and Complications

All Day Room: CH Community, Learning Center

Participants
Jason M. Au, MD, Houston, TX (*Presenter*) Nothing to Disclose
Daniel Ocazionez, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Emma C. Ferguson, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Sandra A. Oldham, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review etiologies of esophageal perforation including: Forceful emesis Iatrogenic endoscopic injury Iatrogenic ablation injury Foreign body impaction Malignancy Postsurgical Complication Review complications of esophageal perforation: Esophagopleural fistula Esophagopulmonary fistula Esophagopericardial fistula Mediastinitis / Abscess Imaging findings of perforation and imaging guidelines.

TABLE OF CONTENTS/OUTLINE

Introduction. Review of cases of esophageal perforation of varying etiology. Imaging findings of esophageal injury, leak, dissection, and fistula formation. Discussion of postoperative results. Conclusion.

CH183-ED-X

Calcium-containing Lesions in the Lung: Friend or Foe?

All Day Room: CH Community, Learning Center

Participants
Constance de Margerie-Mellon, Paris, France (*Abstract Co-Author*) Travel support, Guerbet SA
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Marine Bricout, MD, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Eric De Kerviler, MD, Paris, France (*Presenter*) Research Consultant, Galil Medical Ltd Speaker, Guerbet SA

TEACHING POINTS

Lung calcium deposits can results either from a calcification process or an ossification phenomenon. Lung calcium deposits can occur in a wide variety of disorders. Clinical context, size, number, distribution of the abnormalities as well as associated signs must be taken into account for establishing diagnoses. In case of a unique calcified or ossified nodule, most frequent diagnoses are healed granulomatous lesion, hamartochondroma, primitive bronchopulmonary carcinoma, and carcinoid tumor. Facing multiple calcified or ossified nodules or masses, clinical context may help to distinguish multiple granulomatous lesions, tumoral secondary lesions, metastastic calcfications, multiple hamartochondromas and amyloid nodules. Finally, multiple micronodular lung calcium deposits mostly suggest healed infections (varicella, histoplasmosis) and pneumoconiosis, rarely hemosiderosis or alveolar microlithiasis.

TABLE OF CONTENTS/OUTLINE

Physiopathology of lung calcium deposits Unique calcified or ossified nodule or mass Multiple calcified or ossified nodules or masses Diffuse micronodular lung calcium deposits Synthesis

CH184-ED-X

False Positive Cases in Chest PET/CT Studies in Stage Cancer Patients

All Day Room: CH Community, Learning Center

Participants

Carles G. Zaragoza, MD, Sabadell, Spain (*Presenter*) Nothing to Disclose
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Joan Carles Martin Miramon, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Lluis Berna, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Joseph M. Mata, MD, PhD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Maria Magdalena Serra Salas, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Carlota C. Rodriguez, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To describe the most relevant false positive cases in PET/TC scans when staging cancer patients after initial diagnosis and in the assessment of treatment response. To describe the criteria to avoid these potential pitfalls.

TABLE OF CONTENTS/OUTLINE

We review the PET/TC findings for the false positive cases in chest scans including.Classification: Parenchyma: granulomatous disorders (tuberculosis and sarcoidosis), progressive massive fibrosis in silicosis, round atelectasis, radiation pneumonitis, organizing pneumonia, ARDS, usual interstitial pneumonia. Mediastinum: brown fat, thymic rebound, esophageal and aortic pathology (esophagitis, atherosclerotic plaques), sarcoidosis. Pleura: empyema, pleurodesis. Chest wall and diaphragm: diffuse increase in bone marrow activity, muscular activity, elastofibroma dorsi. Other: catheters, HIV, neurofibroma, sebaceous cyst.We present representative cases, describing the images and discussing the clinical and radiologic findings that allow the correct diagnosis in each case.

CH185-ED-X

Radiological, Seasonal and Clinical Patterns of Respiratory Viral Infections

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Konstantinos Stefanidis, MD, PhD, London, United Kingdom (*Presenter*) Nothing to Disclose
Sarah L. Sheard, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Antonia Scobie, 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. Demonstrate the imaging findings and patterns of many of the viral organisms causing pneumonia.2. Present the seasonal patterns of different respiratory viral pathogens.3. Develop strategies using typical imaging features and clinical parameters for determining if organisms are pathogenic or commensal.

TABLE OF CONTENTS/OUTLINE

1. Case-based review of wide range of viral pneumonias (influenza, parainfluenza, human respiratory syncytial virus, adenovirus, rhinovirus, enterovirus, metapneumovirus, coronavirus).2. Epidemiology, pathology and clinical manifestation of organisms.3. Highlight emerging strains (coronavirus, adenovirus, avian, etc).4. Role of new molecular techniques in the detection of these organisms.5. Clinico-radiologic algorithm for radiologists to diagnose and differentiate viral pneumonias.

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

CH187-ED-X

Reconstructing the Operative Note from CT Images: Signs of Typical Thoracic Surgical Procedures and Their Variations

All Day Room: CH Community, Learning Center

Participants

Konstantinos Stefanidis, MD, PhD, London, United Kingdom (*Presenter*) Nothing to Disclose
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
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Carol Tan, MBBS, Tooting, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
MadhanKumar Kuppusamy, 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

Determining the nature of prior surgical procedures in the thorax can be difficult, particularly if prior surgical details are unavailable or innaccurate. Recognition of the nature of prior surgery can be challenging but is important in determining prior pathology, its extent, and the potential for recurrent disease or postoperative complications.

TABLE OF CONTENTS/OUTLINE

Commencing with axial images, CT signs and indications of prior thoracic surgery are highlighted with expected typical locations and variations of surgical sutures, clips, airway/vascular reorientation. Ancillary features to support suspected surgical intervention are then provided on multiplanar reformats with surgical insights into rationale for variations of surgical technique with respect to approach, bronchial stump length, airway reconstructions, anchoring sutures, clips, etc.Procedures illustrated include:Variations of all lobectomies, sleeve lobectomy variations, segmentectomy, wedge resections, bullectomy, decortication, and others.

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

CH188-ED-X

Miliary Nodules Revisited: Imaging Features, Differential Diagnoses and Mimickers

All Day Room: CH Community, Learning Center

Participants
Jason B. Hobbs, MD, Aurora, CO (*Presenter*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Santiago Martinez-Jimenez, MD, Kansas City, MO (*Abstract Co-Author*) Author, Reed Elsevier; Author, Oxford University Press
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Daniel Ocazionez, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Daniel Vargas, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Discuss the clinical and imaging findings of patients with pulmonary diseases of miliary distribution. Review the differential diagnosis for miliary pulmonary disease and familiarize the radiologist with findings that may help in narrowing that differential diagnosis. Discuss the entities that may mimic miliary distribution.

TABLE OF CONTENTS/OUTLINE

1. Miliary Distribution
a. Imaging appearance
b. Pathophysiology
2. Entities
a. Infectious
i. Tuberculosis
ii. Fungal
1. Blastomycosis
2. Coccidioidomycosis
3. Cryptococcosis
4. Histoplasmosis
iii. Viral
iv. Bacterial
1. Nocardia
2. Salmonella
v. Parasitic (strongyloides)
b. Sarcoidosis
c. Metastases
3. Mimickers of miliary distribution
a. Multifocal micronodular pneumocyte hyperplasia
b. Pneumoconiosis
i. Silicosis
ii. Coal workers pneumonconiosis
c. Pulmonary hemosiderosis
d. Hypersensitivity Pneumonitis
e. Vasculitis

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2015 Honored Educator

CH189-ED-X

Single Energy Iodine Mapping of Pulmonary Perfusion: Pulmonary Embolism and Beyond

All Day Room: CH Community, Learning Center

Participants
Fernando Gonzalez, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Pablo Soffia, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Fabian O. Villacres, MD, Santiago, Chile (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) To provide a pictorial review of the spectrum morphology of iodine mapping lung perfusion defects on subtraction imaging of pulmonary embolism and other pulmonary diseases.2) To describe the principles of single-energy CT subtraction imaging for creating iodine maps as a surrogate for pulmonary perfusion.

TABLE OF CONTENTS/OUTLINE

1) Describe the principles of single energy CT (Computed Tomography) subtraction imaging techniques for creating iodine maps as a surrogate for pulmonary perfusion.2) Rewiew the spectrum morphology of lung perfusion defects on subtraction imaging of pulmonary embolism and other pulmonary diseases.3) Discuss the added value of using iodine mapping to routine evaluation of patients undergoing CTPA (Computed Tomography Pulmonary Angiography) examinations to improve diagnostics accuracy.

CH190-ED-X

Salivary Gland-type Lung Carcinoma: Imaging Features with Radiology-Pathologic Correlation

All Day Room: CH Community, Learning Center

Participants
John P. Lichtenberger III, MD, Bethesda, MD (*Presenter*) Author, Reed Elsevier
Brett W. Carter, MD, Houston, TX (*Abstract Co-Author*) Editor, Reed Elsevier;

TEACHING POINTS

1. Explain the epidemiology, relevant clinical features and natural history of salivary gland-type lung carcinomas.2. Describe key imaging features of salivary gland-type lung carcinomas and their pathologic basis.

TABLE OF CONTENTS/OUTLINE

Epidemiology of salivary gland-type lung carcinomas-Emphasis on key demographic and clinical differences between subtypesPathology of salivary gland-type lung carcinomas and imaging correlates-Emphasis on submucosal gland distribution in the airwaysKey imaging features-Emphasis on discriminating features and critical reporting elementsNatural history of disease and treatment considerations

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Brett W. Carter, MD - 2015 Honored Educator

CH191-ED-X

The Forgotten Heart: Cardiac Abnormalities That Can't Be Missed on Chest CT

All Day Room: CH Community, Learning Center

Participants
Valter R. Dos Santos Junior, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Tassia R. Yamanari, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Bernardo S. Oliveira, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To perform a systematic approach of the heart based on 5 compartiments: Epipericardial fat Pericardium Walls and coronary vessels Endocardium and valves Cardiac chambers To be able to identify relevant cardiac diseases on routine chest CT To comprehend the key concepts of each cardiac disease by the radiological perspective.

TABLE OF CONTENTS/OUTLINE

An introduction to the subject: the ability of present-day routine chest CT to allow heart analysis, even without ECG-gated Presentation of a ***Systematic Approach*** of the heart based on 5 compartiments, from the outside to inwards, showing the most frequent changes in each compartment. ***A review of imaging findings***, highlighting the clinical importance and sample cases of patologies in each compartiment. Epipericárdial fat: acute necrosis. Pericardium: effusion, pericarditis, hemopericardium, pericardial cyst and metastasis. Walls and vessels: lipomatous hypertrhophy of inter-atrial septum, inter-atrial communication and inter-ventricular communication, atrial and ventricular cacification, diffuse miocardial calcification, ventricular aneurysm, miocardic metastasis, coronary calcification. Endocardium and valves: valve calcification. Chambers: intracardiac thrombus (atrial and ventricular), enlarged chambers.

CH193-ED-X

Do you Know the Formation Process of Cysts and Cavities?: Radiologic-pathologic Correlation and Spectrum of Diseases

All Day Room: CH Community, Learning Center

Participants
Takeshi Johkoh, MD, PhD, Itami, Japan (*Presenter*) Research Consultant, Bayer AG Research Consultant, F. Hoffman-La Roche Ltd
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Noriyuki Tomiyama, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To acknowledge the formation process of cysts and cavities.To learn pathologic backgrounds and spectrum of disease showing various cysts or cavities.

TABLE OF CONTENTS/OUTLINE

Formation process of each disease: necrosis; granulomatous diseases, abscess, cancer(Fig1) elastolysis; emphysema, lympphoprolifetative disorders(LPD), ANCA related vasuluitis (Fig 2) destruction; Langerhans' cell histiocytosis(LCH) (Fig. 3) Check valve formation sometimes superimposes other causes and increases sizes of cysts and cavities (Fig 4,5)). Necrosis or destruction along bronchioles causes branching structures which resemble dilated bronchioles in tuberculosis, adenocarcinoma, Wegener's granulomatosis, and LCH. Cavitary nodules can change to thin-walled cysts. Although cysts and cavities are familial radiological findings, their precise formation process has been still unfamiliar. Necrosis, elastolysis, destruction and check valve cause cysts and cavities sometimes in corporation with each other. In this exhibit, formation process of cysts and cavities will be demonstrated with many beautiful radiological images, pathologic findings, and schematic illustrations paying special attention to sequential changes.

CH194-ED-X

Thoracic Venous Aneurysms and Pseudo-aneurysms

All Day Room: CH Community, Learning Center

Participants
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Santiago Martinez-Jimenez, MD, Kansas City, MO (*Abstract Co-Author*) Author, Reed Elsevier; Author, Oxford University Press

TEACHING POINTS

Aneurysms and pseudoaneurysms of the thoracic veins are rare.The clinical significance depends on their size, location and etiology.Their clinical manifestations include chest pain, shortness of breath, hoarseness and neck swelling.Recognition and appropriate identification is paramount for patient management and to prevent complications from unnecessary intervention.Complications include spontaneous thrombosis, and rupture which more often occur in traumatic pseudoaneurysms.

TABLE OF CONTENTS/OUTLINE

Three most common pathophysiologic mechanisms included:Congenital/IdiopathicPost traumaticIatrogenic Table of Contents:Innominate vein aneurysmSuperior vena cava aneurysmSuperior vena cava pseudoaneurysmSuperior vena cava diverticulumIntrathoracic inferior vena cava aneurysmAzygos vein pseudo-aneurysmPulmonary vein aneurysm

Honored Educators

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2015 Honored Educator

CH195-ED-X

Connective Tissue Diseases: Thoracic Complications

All Day Room: CH Community, Learning Center

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TEACHING POINTS

1. To review the spectrum of thoracic complications related to connective tissue diseases (CTD) and illustrate these lesions with selected cases.2. To illustrate the underlying histopathologic findings.3. To provide radiologists an accurate knowledge in order to avoid misdiagnosis.

TABLE OF CONTENTS/OUTLINE

Complications in CTD are relatively common. Their accurate diagnosis requires careful correlation of clinical, radiologic and pathologic features.The aim of this educational exhibit is to illustrate high-resolution CT features of the most common complications, correlating with pathologic findings.Our approach will focous on recognizing the anatomic distribution of changes, defining lesions by their morphologic characteristics, and developing a differential diagnosis based on pathologic-radiologic correlation. Complications related to connective tissue diseases:A) Parenchymal complications: opportunistic infections, haemorrhage, malignancy, drug toxicity B) Air-ways complications: amyloidosis, atelectasis C) Pleural complications: pneumothorax, pleural effusion, empyema, drug toxicity D) Vascular complications: thrombosis, pulmonary hypertension, aneurysms E) Cardiac complications: pericarditis, pericardial effusion, heart failure. F) Other complications: diaphragmatic dysfunction, esophageal dilatation

CH197-ED-X

Nonfatal Air Embolism Complicating Percutaneous Computed Tomography (CT) Guided Lung Biopsy, including VATS Marking: Four Cases from a Single Institution

All Day Room: CH Community, Learning Center

Participants

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TEACHING POINTS

The purpose of this exhibit is:To know the imaging findings of systemic air embolismTo show the Time-dependent change of systemic air embolismTo show the kinetics of the air that may occur during biopsy

TABLE OF CONTENTS/OUTLINE

General information of the air embolism during lung biopsy The imaging findings of systemic air embolism Time-dependent change of systemic air embolism The kinetics of the air that may occur during biopsySummary

CH198-ED-X

Correlation between Lung Perfusion Blood Volume (Lung PBV) and Lung Perfusion SPECT Images in Patients with Chronic Thromboembolic Pulmonary Hypertension (CTEPH) before and after Balloon Pulmonary Angioplasty (BPA)

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants
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TEACHING POINTS

The purpose of this exhibit is:1. To present lung perfusion blood volume (lung PBV) and lung perfusion SPECT images in patients with chronic thromboembolic pulmonary hypertension (CTEPH) before and after balloon pulmonary angioplasty (BPA).2. To understand mechanism of lung PBV imaging.3. To present the lung PBV and lung perfusion SPECT images findings in patients with CTEPH before and after BPA.4. To understand the differences between lung PBV image and lung perfusion SPECT image findings in patients with CTEPH before and after BPA.5. To know clinical feasibility of correlation with lung PBV image and lung perfusion SPECT image findings in patients with CTEPH before and after BPA.

TABLE OF CONTENTS/OUTLINE

1. Mechanism of lung PBV CT imaging.2. Illustrative cases- Review of lung PBV image and lung perfusion SPECT image in patients with CTEPH before and after BPA.3. Discussion4. Summary

CH199-ED-X

Cardiovascular CT from 'Detection to deception'-Anatomic Variants, Pseudolesions and Artifacts

All Day Room: CH Community, Learning Center

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Rashmi S. Katre, MBBS, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To identify the spectrum of normal cardiac and intrathoracic vascular anatomic variants on CT and to distinguish them from pathological process. To describe artifacts and pitfalls commonly encountered in cardiovascular CT imaging. To discuss the approaches and strategies for reducing imaging artifacts and pitfalls.

TABLE OF CONTENTS/OUTLINE

Introduction with overview of the cardiac and intrathoracic vascular anatomy using schematic illustrations and CT images. A brief description of optimal cardiovascular CT imaging technique. Pictorial review of the most commonly encountered imaging pitfalls with their pathophysiology and approaches to reduce/eliminate these errors. **Anatomic variants** – focal hypertrophic cardiomyopathy, lipomatous hypertrophy of interatrial septum, crista terminalis, caseous mitral annular calcification. **Pseudolesions** – pseudolymphadenopathy, pseudothrombus in left atrial appendage, ductus diverticulum, surgical pledgets mimicking pseudoaneurysm, elephant trunk graft mimicking aortic dissection. **Errors in technique**- arterial enhancement mistiming. **Artifacts**- artifacts mimicking stenosis, pulmonary embolism, acute aortic syndrome and dissection. **Errors in interpretation**- overestimation of coronary artery stenosis due calcified plaque. 4. Conclusion with impact on management.

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Carlos S. Restrepo, MD - 2014 Honored Educator

CH200-ED-X

Descending Necrotizing Mediastinitis: When and How Neck Infections Migrate to the Chest

All Day Room: CH Community, Learning Center

Participants

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Rashmi S. Katre, MBBS, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

At the conclusion of this exhibit, participants will be able to: Review the anatomy and interconnection of neck and mediastinal spaces. Recapitulate the pathophysiology of descending necrotizing mediastinitis. Discuss the role of imaging in the diagnosis and management of descending necrotizing mediastinitis. Describe the projectional and cross-sectional imaging findings of descending necrotizing mediastinitis including their differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Introduction with etiopathogenesis. An overview of the neck and mediastinal fascial plane anatomy relevant to pathophysiology of descending necrotizing mediastinitis using schematic illustrations and CT/MRI images. Classification based on the extent of disease using cross-sectional imaging. Multimodality imaging features of the descending necrotizing mediastinitis including their differential diagnosis. Radiographs - Prevertebral soft-tissue swelling, mediastinal widening, mediastinal air and subcutaneous emphysema. CT - Mediastinal air and fluid collections, thickening or enhancement of cervical fascia and muscles, thickening of the subcutaneous tissues in the neck and enlarged lymph nodes with identification of possible oropharyngeal, cervical and odontogenic source of infection. 5. Conclusion with impact on management.

Honored Educators

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CH201-ED-X

Description and Special Management of the Subsolid Pulmonary Nodules

All Day Room: CH Community, Learning Center

Participants
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Isabel Torres Sanchez, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1Describe what a subsolid nodule is and review the appropriate terminology involving its description and etiology.2Review the new classification for lung adenocarcinoma and establish the relation between it and subsolid nodules.3Present the Fleishner Society Guideliness regarding the proper management of subsolid pulmonary nodules detected on CT scan.

TABLE OF CONTENTS/OUTLINE

Subsolid nodule is a focal area of increased attenuation through which normal parenchymal structures can be visualized. The term subsolid includes "pure ground glass nodules (GGN)" and "part-solid GGN'. SSNs are considerate as a category separate from purely solid lesions from a management perspective, as established by the Fleischner Society in its 6 specific recommendations (three regarding solitary subsolid nodules and three regarding multiple subsolid nodules). SSN have different etiologies including many benign conditions; however researchers have determined that the malignancy rate of SSNs is higher than that of solid nodules.Persistent SSNs likely represent a spectrum of peripheral adenocarcinoma or its precursors histologic subtypes. The CT manifestations of SSN help radiologists manage these lesions. They have variable growth patterns and thin section imaging is important in the assessment of such nodules.

CH202-ED-X

Here We Go Again-A Pictorial Review of the Upcoming Changes to the TNM Staging System for Lung Cancer

All Day Room: CH Community, Learning Center

Participants
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TEACHING POINTS

1. Discuss the rationale behind the upcoming changes to the TNM staging system for lung cancer2. Illustrate the changes to the TNM descriptors3. Highlight the subsequent changes to the TNM groupings4. Discuss IASLC guidelines for staging multiple suspected lung cancer

TABLE OF CONTENTS/OUTLINE

OverviewThe 7th edition of the TNM classification for lung cancer was published in 2009 and represented a paradigm shift in lung cancer staging with system based on the largest ever lung cancer cohort established from the International Association for the Study of Lung Cancer (IASLC) staging project.Reason for changeDespite the magnitude of the database not all descriptors could be validated in the retrospective cohort. The new (8th) TNM edition is based on 77,156new patients and will result in significant changes to the staging system, in particular the T and M descriptors. The revision will be enacted in January 2017. Imaging Review - StagingThis educational exhibit will review the modifications to the staging system with comparative tables (table 1,2 and 3) and clinical cases (figure 1) that illustrate these changes. Imaging Review - Multiple CancersThe exhibit will also review the proposals for classifications of lung cancers with multiple pulmonary sites of involvement in the 8th edition of the TNM classification (figure 2).

CH203-ED-X

Development of the Real-time CT-NAB Navigation System Using Projection Mapping

All Day Room: CH Community, Learning Center

Participants
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TEACHING POINTS

The operator must observe a patient and a CT monitor in turn in real-time CT-NAB using the CT fluoroscopy. This causes the decrease of the precision and the extension of the inspection time. We developed real-time CT-NAB system using projection mapping to solve this problem.

TABLE OF CONTENTS/OUTLINE

Content (1)Development of the real-time CT-NAB navigation system using projection mapping. (2)Distortion making of the CT image for Projection mapping. (3)Projection of the real-time CT-NAB image to the body surface of the patient. (4)The removal of the obstacle due to the arm of the operator. (5)Evaluation for the patient movement.Conclusion (1)The Projection mapping system which we built was available for a projection from any direction. (2)The precision to insert improved and shortened it at inspection time. (3)The obstacle due to the arm of the operator was able to decrease by the choice of the projection direction. (4)Even if a patient moved during inspection, the Projection mapping image followed it.

CH204-ED-X

Lung Disease in the Immunosuppressed Transplant Patient-Solid Organ and Hematopoietic Stem Cell Transplants

All Day Room: CH Community, Learning Center

Participants

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TEACHING POINTS

Solid organ and Hematopoietic stem cell transplant (HSCT) can make the host susceptible to a variety of complications.Both infectious and non-infectious complications from solid organ and stem cell transplant occur in the lungs.Imaging features and knowledge of the timeline from the transplant, type of immune suppression and the presence of pharmaceutical prophylaxis is crucial in making a diagnosis.

TABLE OF CONTENTS/OUTLINE

Teaching PointsType and subtype of transplant Solid Organ - Lung, Heart, Kidney, Liver Hemapoietic Stem Cell Transplant (HSCT)Subtypes: HSCTTime since transplantProphylaxis historySolid Organ Transplant 0-30 Days-Infectious(RSV, Pseudomonas) 0-30 Days-Non-Infectious (Edema, PTE) 30 days-6 months-Opportunistic infection(CMV, Nocardia, PCP)-Prophylaxis >30 days- 6 months-Noninfectious Complications >6 months –Infectious-(Community Acquired, TB, MAC) >6 months -Noninfectious Complications(Graft vs Host, PTLD)HSCT: Time Since Transplant Pre-engraftment ,Neutropenic 0-30 days-Opportunistic Infections(Mucormycosis) 0-30 days- Non Infectious lung complications (DAH) Early Post-transplant -31-100 days-Fungal cavitation Non Infectious Lung Complications: 31-100 days(IPS) Late Post-transplant >100 days-Predominantly non-infectious causes of lung disease (BOS)References

CH207-ED-X

The Role of Imaging in Combined Pulmonary Fibrosis and Emphysema Syndrome (CPFE)

All Day Room: CH Community, Learning Center

Participants
Carlos F. Munoz-Nunez, MD, Valencia, Spain (*Presenter*) Nothing to Disclose
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TEACHING POINTS

Combined Pulmonary Fibrosis and Emphysema (CPFE) is a clinical syndrome characterized by dyspnea, upper-lobe emphysema, lower-lobe fibrosis and abnormalities in gas exchange with impairment of DLCO. MDCT plays a pivotal role in the recognition of this syndrome characterized by relatively normal lung volumes and spirometry and severe gas exchange. CPFE was first described in male smokers aged 60-70 years, but since then it has been described also in younger women with rheumatoid arthritis and systemic sclerosis, in inherited or acquired abnormalities of surfactant proteins, mineral dust exposure and hypersensitivity pneumonitis among others. CPFE is also known for characteristic complications: pulmonary hypertension, lung cancer and acute lung injury. The goals of this presentation are:1. To review the imaging findings in Combined Pulmonary Fibrosis and Emphysema Syndrome (CPFE).2. To review the spectrum of different etiologies of CPFE.2. To review the imaging features of complications in CPFE.

TABLE OF CONTENTS/OUTLINE

1. Introduction.2. Imaging in CPFE: different types of emphysema and fibrosis.3. Etiologic spectrum of CPFE.4. Imaging complications of CPFE.

CH209-ED-X

Thoracic and Extra-thoracic Histoplasmosis: Spectrum of Imaging Findings

All Day Room: CH Community, Learning Center

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Chang k. Chi, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review the pathogenesis, epidemiology and clinical manifestations of histoplasma infection Illustrate and review the imaging spectrum of pulmonary, mediastinal and extra-thoracic manifestations of histoplasmosis Discuss the therapy recommendations and the role of imaging in the decision-making Illustrate some potential complications related to histoplasmosis Briefly review main differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Overview of the pathogenesis, epidemiology and clinical manifestations of histoplasmosis Discussion of the most common imaging patterns of thoracic and extra-thoracic histoplasma disease in immunocompetent and immunocompromised patients and the possible complications, including: Pulmonary manifestations: histoplasmoma, acute histoplasmosis (air-space consolidation), acute disseminated histoplasmosis (miliary and reticulo-nodular pattern) and chronic cavitary form Mediastinal manifestations: lymphadenopathy, mediastinal granuloma and fibrosing mediastinitis Abdominal manifestations: lymphadenopathy, liver, adrenal and spleen lesions Highlight the role of imaging in the management and follow-up of pulmonary histoplasma infections.

CH210-ED-X

The Role of Chest CT in the Staging of Thymic Malignancies

All Day Room: CH Community, Learning Center

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Dewey J. Conces Jr, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose

TEACHING POINTS

1. Prognosis and treatment planning depends on the stage of the thymoma.2. Chest CT findings define the extent of the tumor and provide important information for planning the surgical resection of the tumor.3. This exhibit will familiarize the radiologist with the characteristic CT findings of thymomas that are encountered in each of the stages of the Masaoka-Koga staging system and discuss findings which impact the planning of curative surgery.4. Knowledge of the staging systems for thymic neoplasms allows the radiologist to meaningfully contribute to the treatment of patients with thymic malignancies.

TABLE OF CONTENTS/OUTLINE

1. Introduction: basic information on thymic malignancies.2. Discussion of the Masaoka-Koga staging system and the WHO classification of thymic epithelial neoplasms.3. Review of treatment options based on the stage of the disease.4. Discussion of the use of chest CT imaging in the diagnosis, staging and treatment planning of thymomas.5. Imaging review of the CT findings and staging of thymic neoplasms.

CH211-ED-X

Spectrum of Thoracic Manifestations of Breast Cancer: Neoplastic and Non-neoplastic Radiologic Features with Pathologic Correlation

All Day Room: CH Community, Learning Center

Participants

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TEACHING POINTS

The purpose of this exhibit is:
1. To learn various types of thoracic metastases from breast cancer
2. To demonstrate breast cancer metastases mimicking primary lung cancer with emphasis on clinical significance of differentiation
3. To review thoracic manifestations of non-neoplastic lesions related to breast cancer

TABLE OF CONTENTS/OUTLINE

1. Typical and atypical thoracic metastases from breast cancer
i. Mass with cavity
ii. Mass with calcification
iii. Tumor embolism and pulmonary tumor thrombotic microangiopathy : PTTM
iv. Consolidation with or without ground-glass opacity
v. Endobronchial metastases
vi. Lymphangitis carcinomatosa
vii. Extra-pulmonary metastases (pleura, bone, skin, muscle)
2. Breast cancer metastases mimicking primary lung cancers
i. Key features to differentiate primary lung cancers from breast cancer metastases
ii. Clinical significance in differentiation of the two
3. Non-neoplastic lesions related to breast cancer
i. Pathology related to irradiation (rib fractures, pneumothorax, radiation pneumonia, organizing pneumonia)
ii. Non-neoplastic lesions mimicking lymph node metastases (sarcoidosis, tuberculosis, collagen vascular diseases)
iii. Pulmonary drug toxicity associated with chemotherapy
iv. Manifestations associated with implants (rupture, foreign body granuloma, adjuvant disease)

CH212-ED-X

Pericystic Lung Nodules: Distinguishing the Indolent from the Malignant

All Day Room: CH Community, Learning Center

Awards
Identified for RadioGraphics

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TEACHING POINTS

1. Recognition that pericystic pulmonary nodular abnormalities have a high incidence of malignancy.
2. Distinguishing the morphological appearances of benign and malignant pericystic nodules in the lung
3. Review of the evidence base for the pathology, detection and management of such lesions.

TABLE OF CONTENTS/OUTLINE

Review of serial chronological imaging of pericystic nodules Pathology of pericystic lung cancer Pitfalls resulting in delayed diagnosis of lung cancer (suspected inflammation, perception errors) Tips for multiplanar/CAD assisted review Review of screening data of pericystic nodules and IELCAP experience Differentiation from simulating benign entities (inflammation, infection including Aspergillus, CPAM, trauma) Differentiation from other genuine pericystic entities (e.g. Lymphocytic pneumonitis, amyloid, lymphoma).

Honored Educators

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

CH213-ED-X

Imaging Findings and Follow up of Tomographic Changes after Stereotactic Radiotherapy of Lung Lesions

All Day Room: CH Community, Learning Center

Participants
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Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Imaging presentation of acute and late changes after pulmonary stereotactic radiotherapy (SBRT) at computed tomography (CT). 2. Recognition of CT findings suggestive of disease recurrence. 3. Role of CT and PET in follow-up and management of lung changes after SBRT.

TABLE OF CONTENTS/OUTLINE

A large body of evidence supports SBRT as an effective therapeutic approach for early-stage non-small cell lung cancer (NSCLC), especially for small lesions in non-operable patients, being also employed in the treatment of some metastasis. Post-SBRT pulmonary changes differ from those expected after conventional radiotherapy and can often mislead the evaluation of treatment response at follow-up CT scans. This study makes a case-based review of acute and late changes expected after lung SBRT and findings suggestive of recurrence at CT and PET.

CH214-ED-X

Manifestations of Eosinophilic Diseases of the Lung

All Day Room: CH Community, Learning Center

Participants

Melissa Price, MD, Boston, MA (*Presenter*) Nothing to Disclose
Matthew D. Gilman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brett W. Carter, MD, Houston, TX (*Abstract Co-Author*) Editor, Reed Elsevier;
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jo-Anne O. Shepard, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Carol C. Wu, MD, Houston, TX (*Abstract Co-Author*) Author, Reed Elsevier

TEACHING POINTS

Eosinophilic lung diseases encompass a broad range of conditions in which patients present with pulmonary opacities and eosinophilia of the serum, pulmonary tissue, or bronchoalveolar lavage fluid. These diseases exhibit a wide range of imaging findings including consolidation, ground-glass opacities, nodules and masses. Given the relatively rare nature and non-specific clinical presentation, the findings on CT may be the first clue to the diagnosis. When pertinent clinical information such as underlying asthma, travel history, or recent exposure to medications is combined with the identification of characteristic imaging features, the diagnosis can frequently be made.

TABLE OF CONTENTS/OUTLINE

Review current classification and diagnostic criteria for eosinophilic lung diseases.Illustrate the imaging features of the various eosinophilic lung diseases with an emphasis on thin-section CT findings including: acute eosinophilic pneumonia, chronic eosinophilic pneumonia, simple pulmonary eosinophilia, eosinophilic granulomatosis with polyangiitis, hypereosinophilic syndrome, allergic bronchopulmonary aspergillosis, and eosinophilic pneumonia secondary to drugs, toxins, radiation, and parasitic infection.Highlight pearls and pitfalls in imaging eosinophilic lung diseases including mimics and differential diagnoses.

Honored Educators

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Brett W. Carter, MD - 2015 Honored Educator
Mylene T. Truong, MD - 2015 Honored Educator

CH215-ED-X

Breathing It All In: A Health System's Approach to Asbestos Screening

All Day Room: CH Community, Learning Center

Participants
Bhavin Patel, MD, Washington, DC (*Presenter*) Nothing to Disclose
Taemee Pak, Carle Place, NY (*Abstract Co-Author*) Nothing to Disclose
Stuart L. Cohen, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose
Jacqueline Moline, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose
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Amar B. Shah, MD, Long Island City, NY (*Abstract Co-Author*) Future royalties, Wolters Kluwer nv
Navid Rahmani, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose
Rakesh D. Shah, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review the epidemiology and pathophysiology of asbestos-related disease. Discuss CT screening literature and controversies. Explain our institution’s screening process. Characterize the pulmonary and non-pulmonary manifestations of asbestos through physical exam, test, and imaging findings. Portray an efficient image-guided algorithm to the clinical management of pulmonary and non-pulmonary findings on yearly screening CT.

TABLE OF CONTENTS/OUTLINE

Introduction and epidemiology National asbestos screening – current guidelines National asbestos screening – current topics of debate Our asbestos screening – current guidelines Our asbestos screening – pre-imaging workup Our asbestos screening – imaging technique Asbestos manifestations and our management algorithm Pulmonary Non-pulmonary

CH217-ED-X

Check out that Posterior! Categorization and Imaging Characteristics of Posterior Mediastinal Masses

All Day Room: CH Community, Learning Center

Participants
Scott Sosin, DO, Morristown, NJ (*Presenter*) Nothing to Disclose
Marci R. Handler, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Christina Boyd, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Pratik M. Mavani, MD, Syracuse, NY (*Abstract Co-Author*) Nothing to Disclose
Neil Anand, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose
Anh V. Ngo, MD, Morristown, NJ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review and analyze the classification and etiology of posterior mediastinal masses. Learn the cross-sectional imaging characteristics of the various causes of posterior mediastinal masses. Based on specific imaging features and clinical history, learn and understand the differential diagnosis of posterior mediastinal masses. Discuss the appropriate work-up, management, and follow-up of the presented posterior mediastinal masses.

TABLE OF CONTENTS/OUTLINE

Posterior mediastinal masses are a challenging group of broad differentials, which comprise multiple systems. We will perform a case-based categorized review of various posterior mediastinal masses, which will allow for a more thorough diagnostic approach. After completion of this educational exhibit, the reader will be able to recognize the various types of posterior mediastinal masses and understand how to use clinical history and imaging characteristics to aid in differential diagnoses. 1. Neoplasm Neurogenic: Nerve sheath tumors - Neurofibroma, Schwannoma; Sympathetic chain tumors - Neuroblastoma, Ganglioneuroblastoma, Ganglioneuroma Non-neurogenic: Ewing's sarcoma, Chondrosarcoma, Lymphoma, Esophageal neoplasms, Metastasis2. Infection/Inflammation Paraspinal abscess Sinus histiocytosis3. Vascular Descending thoracic aortic aneurysm Esophageal varices

CH218-ED-X

Drug Induced Lung Disease: The Minimum Radiologists Should Know in the Era of Molecularly Targeted Therapy

All Day Room: CH Community, Learning Center

Participants

Midori Enokido, Tokyo, Japan (*Presenter*) Nothing to Disclose
Takahisa Kurosaki, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoki Kyosaka, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Jay Starkey, MD, 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

TEACHING POINTS

After the introduction of molecular targeted and monoclonal antibody therapies, the strategies for treatment of malignant and chronic inflammatory diseases have rapidly changed. Patients frequently have excellent outcomes; however, we also struggle with new adverse side effects of these new therapies. The lung is the main organ affected adversely. Therefore, it is important to recognize new forms of DILDs. The purpose of the exhibit is to introduce and demonstrate the radiologic patterns of DILDs related to new therapies. We also provide useful radiologic information necessary to make early DILD diagnosis.

TABLE OF CONTENTS/OUTLINE

1.Varied radiologic pattern of DILDs We show the typical imaging findings of DILD, including interstitial lung disease, organizing pneumonia, hypersensitivity pneumonia, and miscellaneous disease patterns.2.DILD by specific disease We demonstrate and explain specific, typical imaging patterns related to each DILD for the following:-Traditional chemotherapeutics（non- molecularly targeted therapy） Docetaxel hydrate, Cyclophosphamide, Doxorubicin, Hydroxycarbamide/hydroxyurea- Molecularly targeted therapy Temsirolimus, Sunitinib, Pazopanib, Dasatinib.-Anti-rheumatoid drugs Methotrexate, Bucillamine.-Immunosuppressive drugs Azathioprine.-Anti-arrhythmic medications Amiodarone.

CH219-ED-X

Redefining the Role of Imaging in Predicting the Risk of Malignancy in Incidental Pulmonary Nodules: Updates and Persistent Limitations

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Naveen Sharma, MRCP, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Ronan Breen, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Alexia Farrugia, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sujal R. Desai, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rebecca Preston, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Zaid N. Viney, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
George Santis, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Arjun Nair, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

This exhibit aims to: Give an overview of, as well as compare and contrast, different risk prediction models used to predict the likelihood of malignancy in pulmonary nodules. Describe how these models have been assimilated into contemporary strategies for pulmonary nodule management Demonstrate how imaging-derived metrics have been increasingly incorporated into risk prediction Describe variations in imaging techniques and in application of risk prediction models that can lead to heterogeneity in clinical management

TABLE OF CONTENTS/OUTLINE

Established (e.g. Bayesian, Mayo, Veterans) and novel (e.g. Brock, Herder, BIMC) risk prediction models: rationale behind each, and comparisons between models Summary of recent guidelines for nodule follow-up: ACCP 2013, Fleischner society sub-solid nodule 2013, British Thoracic Society 2015, Asian consensus guidelines 2016 - emphasis on how different risk prediction models used Imaging parameters incorporated into risk prediction e.g. volumetric analysis of size and growth, PET-CT avidity, emphysema assessment Case-based demonstration of how using different measurement techniques and models can lead to different follow-up recommendations Technical factors influencing reliability of various imaging parameters and suggestions for standardisation e.g. iterative reconstruction, convolution kernels

CH220-ED-X

Mediastinal Lipomatous Lesions and Mimics

All Day Room: CH Community, Learning Center

Participants
Fu-Zong Wu, Kaohsiung, Taiwan (*Presenter*) Nothing to Disclose
Yu Yen, Kaohsiung City, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chiao Meei Chen, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose
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Shu Tin Huang, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Ming-Ting Wu, MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Adipose content can be easily recognized on CT and MRI. When fat-containing lesions are detected, identification of their anatomic location and imaging characteristics may suggest a specific diagnosis or narrow the differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Background Information:Lipomatous tumors are the most common soft-tissue tumors (approximately half of all soft-tissue tumors). Mediastinal lipomatous lesions are often encountered in daily radiologic practice.Method and materialIn this article, we illustrate various mediastinal lipomatous lesions according to the anatomic mediastinal compartments and characteristic imaging findings.Result:The fat-containing lesions in the mediastinum include germ cell neoplasms, thymolipoma, lipoma, osteolipoma, liposarcoma, lipomatosis, lipoblastoma, and extramedullary hematopoiesis. Most of them present nonspecific findings such as enlarged cardiac silhouette, mediastinal soft-tissue mass, or widened mediastinum on conventional radiography. CT is the modality of choice that provides excellent anatomic location and detection of fat attenuation.Conclusion:Identification of their anatomic location of mediastinum and imaging characteristics may suggest a specific diagnosis or narrow the differential diagnosis.

CH221-ED-X

Interstitial Pneumonia with Autoimmune features (IPAF): A New Concept Which Radiologists Should Know

All Day Room: CH Community, Learning Center

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Certificate of Merit

Participants
Go Takeshita, MD, Saga-City, Japan (*Presenter*) Nothing to Disclose
Ryoko Egashira, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Takahiko Nakazono, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Ken Yamaguchi, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Junya Fukuoka, Nagasaki City, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Irie, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To review the concept of IPAF To understand the clinical and pathological conditions in IPAF To demonstrate the known HRCT findings of IPAF To learn the role of radiologists involved in the practice of interstitial pneumonia

TABLE OF CONTENTS/OUTLINE

Review the concept of IPAF History The spectrum or difference between IPAF and undifferentiated connective tissue disease (UCTD), auto-immune featured interstitial lung disease (AIF-ILD) and lung-dominant connective tissue disease (LD-CTD) Classification criteria Clinical and pathological features of IPAF HRCT findings of IPAF with pathologic correlation: NSIP, OP, NSIP with OP overlap, LIP, IP with lymphoid aggregates with germinal centers Future issues

CH222-ED-X

Radiation-induced Thoracic Disease: What the Radiologist Has to Know

All Day Room: CH Community, Learning Center

FDA Discussions may include off-label uses.

Participants

Antoine Khalil, MD, Paris, France (*Presenter*) Spouse, Employee, Amgen Inc; Research Consultant, C. R. Bard, Inc; Research Consultant, GEMS; Research Consultant, Cook Group Incorporated; Research Consultant, Mectronic, Inc
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Valerie Gounant, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Jean-Pierre Laissy, MD, PhD, Paris, France (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

- To review the various types of radiotherapy and their side effects- To understand mechanisms of the side-effects and its prevention - To recognize or suspect the radiation-induced lesions of the chest with different imaging modalities (plain chest radiograph, CT scan, MRI).- To recognize the differential diagnosis and the imaging abnormalities.

TABLE OF CONTENTS/OUTLINE

- Radiation-induced toxicity is strongly dependent of radiation modalities (radiation field, dose fractionation, total applied dose) and other factors (underlying lung disease and associated treatment).- On pathology, lung parenchymal damages occur in three phases, an acute exudative phase, an organizing phase, and a chronic fibrotic phase- The imaging of radiation-induced lung disease follows the pathology observations. Different findings could be observed such as ground glass opacities, lung consolidation and later fibrosis. - The immune reaction to radiation induces an organizing pneumonia out of the radiation field.- Outside the pulmonary parenchyma, other side effects occurred to the chest wall (rib fractures, malignant transformation, pain), tracheobronchial tree injury (stenosis), mediastinal vessels (stenosis, necrosis with rupture), heart (myocarditis, pericarditis, heart valves, ischemic heart disease) and spinal cord (radiation myelopathy).

CH223-ED-X

Functional Imaging of Chest Wall Tumors

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Jordi Broncano, MD, Cordoba, Spain (*Presenter*) Nothing to Disclose
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Antonio Alvarez-Kindelan, Cordoba, Spain (*Abstract Co-Author*) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Antonio Luna SR, MD, Jaen, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To **analyze** the current functional imaging techniques available (18FDG-PET/CT, DWI, DCE-MRI; MR spectroscopy) for the evaluation of chest wall lesions, with a focus in their correct *acquisition* and *post-processing*. To **review** the clinical applications of these techniques in the diagnostic approach of benign and malignant primary and secondary conditions of the chest wall.

TABLE OF CONTENTS/OUTLINE

1.Introduction2. Imaging techniques optimization2.1. Diffusion weighted imaging (DWI)2.2. MR - spectroscopy2.2. Perfusion – weighted MRI (DCE-MRI)2.3. 18FDG-PET/CT3.Clinical applications3.1. Bone tumors3.2. Soft tissue tumors3.2.1. Fat containing tumors3.2.2. Vascular tumors3.2.3. Peripheral nerve sheath tumors3.2.4. Fibroblastic, myofibroblastic and fibrohistiocitic lesions3.2.5. Tumors of cutaneous origin3.3. Metastatic disease and chest wall invasion3.4. Lymphoma3.5. Treatment monitoring and recurrence detection4. Diagnostic imaging strategy in different clinical scenarios4.1. PET and MR - advantages and disadvantages4.2. Diagnostic algorrythm5. Conclusion

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Sanjeev Bhalla, MD - 2014 Honored Educator
Sanjeev Bhalla, MD - 2016 Honored Educator

CH224-ED-X

Tracheal tumors: Radiologic-pathologic Correlation of Tracheal Tumors and Tumor Mimics

All Day Room: CH Community, Learning Center

Participants
Arash Bedayat, MD, Worcester, MA (*Presenter*) Nothing to Disclose
Pallavi K. Galera, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose
H. Henry Guo, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review cross sectional findings of tracheal tumors and tumor-like entities.
2. Direct comparison of imaging findings with histologic pathology findings.
3. Discuss pearls and pitfalls in accurately diagnosing and classifying tumors.

TABLE OF CONTENTS/OUTLINE

Classification of tracheal tumors. Describe the cross sectional features of tracheal tumors and their mimics with their pathologic correlates. Identify the imaging and non-imaging features of each of these tumors that may allow differentiation from others. Discuss the mimics, diagnostic pitfalls and management of the discussed entities.

CH225-ED-X

Chronic Lung Allograft Dysfunction (CLAD): A Paradigm Shift

All Day Room: CH Community, Learning Center

Participants

Kiran Batra, MD, Coppell, TX (*Presenter*) Nothing to Disclose
Stephen Fisher, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Asha Kandathil, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Jacqueline T. Caire, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Sachin S. Saboo, MD, FRCR, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
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

TEACHING POINTS

Define and classify CLAD into various phenotypes with examples. Stepwise algorithm to differentiate and approach diagnosis of each phenotype with possible confounding factors. Current limitations and future horizons in role of imaging and effective approach for treatment and prevention of CLAD.

TABLE OF CONTENTS/OUTLINE

Describe the paradigm shift in the terminology of chronic rejection following lung transplantation. Differentiate clinically distinct phenotypes by history, allograft function, and imaging. Discuss current limitations and role of multidisciplinary evaluation of imaging, pathology, and lung function to further characterize CLAD phenotypes.

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Suhny Abbara, MD - 2014 Honored Educator

CH226-ED-X

Hot off the Press: Imaging Review of the 8th Edition of the TNM Classification for Lung Cancer

All Day Room: CH Community, Learning Center

Participants
Jose Gutierrez Chacoff, MD, Santiago, Chile (*Presenter*) Nothing to Disclose
Nicole L. Restauri, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Cristian Varela, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Thomas D. Suby-Long, MD, Highlands Ranch, CO (*Abstract Co-Author*) Nothing to Disclose
Francisca Leiter, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Daniel Vargas, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Discuss the changes to the T and M descriptors included in the 8th TNM classification for lung cancer Review the changes for lung cancers with multiple pulmonary sites of involvement, emphasizing on its four patterns Familiarize the radiologist with the new staging based on the TNM classification.

TABLE OF CONTENTS/OUTLINE

Changes in classification of tumor size (T descriptor)Other changes to the T descriptor: Involvement of main bronchus Partial lung atelectasis or obstructive pneumonitis Invasion of diaphragm New T1a(mi) descriptorChanges to the M descriptorLung cancers with multiple pulmonary sites of involvement Second primary lung cancers Separate tumor nodules (intrapulmonary metastasis) Multifocal lung adenocarcinoma with ground glass/lepidic features Diffuse Pneumonic-type of lung adenocarcinomaChanges to overall stage based on TNM classificationSchematic view of 8th edition of the TNM for Lung Cancer

CH227-ED-X

Evolving Immunologic Evidence in Rheumatoid Arthritis: the Lungs, Culprit or Victim?

All Day Room: CH Community, Learning Center

Awards
Cum Laude

Participants
Kelly Capel, MD, Madison, WI (*Presenter*) Nothing to Disclose
Cristopher A. Meyer, MD, Madison, WI (*Abstract Co-Author*) Stockholder, Cellectar Biosciences, Inc Investor, NeuWave, Inc
Jeffrey P. Kanne, MD, Madison, WI (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation; Advisory Board, F. Hoffmann-La Roche Ltd

TEACHING POINTS

Briefly outline diagnostic criteria and sensitivities and specificities for serologic markers in rheumatoid arthritis (RA). Review proposed pathogenesis of RA with the lung as the potential site of the initial immunological insult Present recent data on airway disease as an early manifestation of RA and emphasize the importance of obtaining expiratory images Describe the thoracic imaging findings in RA including rheumatoid nodules, follicular bronchiolitis, and pulmonary fibrosis Review the risk factors for diffuse lung disease (DLD)in RA patients and the fact that prognosis depends on histopathologic type Disease modifying antirheumatic drugs (DMARDs) may result in pulmonary drug toxicity. Recognize the imaging findings in patients with rheumatoid arthritis and distinction from disease manifestations or infection

TABLE OF CONTENTS/OUTLINE

Introduction/Disclosures RA Diagnostic Criteria created by the European League Against Rheumatism (EULAR) in 2010 Theory of pathogenesis Airway manifestations of RA and importance of expiratory imaging Lung imaging findings in RA including DLD, rheumatoid nodules, and RA drug toxicity Risk factors for RA-DLD and compare prognosis of DLD subtypes Imaging findings of different subtypes of DLD in RA patients Summary

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Jeffrey P. Kanne, MD - 2012 Honored Educator
Jeffrey P. Kanne, MD - 2013 Honored Educator

CH228-ED-X

The Close Relationship between Kidneys and Lungs: A Systematic Review

All Day Room: CH Community, Learning Center

Participants
Hatice Savas, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Rishi Agrawal, MD, Chicago, IL (*Abstract Co-Author*) Speakers Bureau, Boehringer Ingelheim GmbH
Nishant D. Parekh, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Eric M. Hart, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Yu-Kai Su, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Frank H. Miller, MD, Chicago, IL (*Abstract Co-Author*) Research Grant, Siemens AG

TEACHING POINTS

Clinical conditions with multisystem involvement are common problems in daily practice. In this educational exhibit, we will discuss the wide spectrum of both common and rare conditions that affect the kidneys and lungs. Some findings in the lung that may be considered incidental can have a profound impact on the kidney and vice versa. Other findings are more straightforward and easy to recognize.

TABLE OF CONTENTS/OUTLINE

Our presentation will systematically review the pulmonary manifestations of:Immune related renal pathologies /Pulmonary renal syndrome: Goodpasture disease Churg Strauss SLE HELLP Granulomatosis with PolyangiitisAcute or Chronic Kidney disease Pulmonary edema Metastatic pulmonary calcifications Renal transplant related conditions Infection Drug toxicity GVHDGenetic Conditions Adult polycystic kidney disease Tuberous Sclerosis Birt Hogg DubeMiscellaneous Erdheim Chester disease Renal cell carcinoma metastasis

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Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator

CH230-ED-X

Pleuroparenchymal Fibroelastosis: Variations in Imaging and Etiologies

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Ryoko Egashira, MD, Saga, Japan (*Presenter*) Nothing to Disclose
Takahiko Nakazono, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Ken Yamaguchi, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Satoshi Watanabe, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuko Waseda, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Irie, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To learn the concept of pleuroparenchymal fibroelastosis and its meaning in the ATS/ERS classification of IIPs To understand the various etiologies which may present PPFE pattern on HRCT To learn HRCT findings of ILD cases with PPFE pattern with histopathologic correlation

TABLE OF CONTENTS/OUTLINE

1. Review the concept of pleuroparenchymal fibroelastosis: newly introduced to IIPs as a rare pattern, difference from apical cap fibrosis2. HRCT findings of various etiologies showing PPFE pattern with pathologic correlation Idiopathic: Idiopathic PPFE, IPF with PPFE, NSIP with PPFE Chronic hypersensitivity pneumonitis Connective tissue diseases Post-bone marrow transplantation Recurrent respiratory infections: non-tuberculous mycobacterium infection, aspergillosis Sarcoidosis

CH232-ED-X

Imaging Findings of Congenital Cardiopulmonary Diseases in Adults: A Pictorial Essay

All Day Room: CH Community, Learning Center

Participants

Tassia S. Paixao, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Hye J. Lee, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Kai Chi Chang, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Rodrigo S. Damasceno, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Guilherme H. Bachion, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcio V. Sawamura, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Claudia D. Leite, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Research Grant, General Electric Company
Saulo Cantoni, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Daniela F. Vieira Vendramini, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Anthony R. Souza, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Anthony R. Souza, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Brief review of the most common and uncommon congenital cardiopulmonary anomalies in adults Recognize the imaging findings of this cardiopulmonary anomalies in adults, emphasizing the relevance and possible complications of this anomalies in adulthood

TABLE OF CONTENTS/OUTLINE

1. Discuss and illustrate incidental findings and potential life-threatening complications related to congenital cardiopulmonary anomalies in adults, including: unilateral pulmonary artery agenesis, anomalous venous pulmonary drainage, cystic adenomatoid malformation, bronchial atresia, pulmonary sequestration and cardiovascular malformations, such as interatrial communication and interventricular communication.
2. Highlight and discuss the mechanisms of the possible complications associated with this anomalies, including: pulmonary infection in bronchial atresia, pulmonary hemorrhage in pulmonary sequestration, pulmonary hypertension in interventricular communication.

CH233-ED-X

State-of-the-art MRI of the Heart and Lungs in Evaluation of Pulmonary Hypertension

All Day Room: CH Community, Learning Center

Participants

Christopher Maroules, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Susan Matulevicius, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Kelly Chin, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Fernando Torres, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Prabhakar Rajiah, MD, FRCR, Dallas, TX (*Presenter*) Institutional Research Grant, Koninklijke Philips NV; Speaker, Koninklijke Philips NV

TEACHING POINTS

To review the etiology and pathophysiology of pulmonary hypertension (PH) To discuss the state-of-the-art MRI sequences available for the evaluation of PH To review the role of MRI in the evaluation of PH To illustrate the imaging appearances of various causes of PH that can be evaluated with MRI.

TABLE OF CONTENTS/OUTLINE

Introduction Definition & classification of PH Role of MRI in the evaluation of PH MRI sequences- Review of several sequences and their utility in PH- **Black blood-** Morphology; **HASTE/VIBE**- Morphology of lung; **Ultra-short TE-** Morphology of lung; **Cine imaging-** Septal flattening, ventricular volumes, function, myocardial mass, morphology, TAPSE; **Strain imaging**- Regional myocardial function; **Flow imaging-** Pulmonary and systemic flow, shunt quantification, arterial stiffness; **MR angiography-** (Regular/time resolved)- Vascular anatomy, pulmonary perfusion, Chronic PE; **Arterial spin labelling**- Pulmonary perfusion; **Late gadolinium enhancement**- Myocardial fibrosis, tissue characterization, prognostic determination; **T1 mapping-** Tissue characterization, prognosis Illustration of common causes of PH with sample cases- Left heart diseases; Lung disease- COPD, Interstitial lung disease; Chronic pulmonary embolism; Congenital abnormalities such as cardiovascular shunts- ASD, VSD, PDA Diagnostic algorithm Future directions

Honored Educators

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Prabhakar Rajiah, MD, FRCR - 2014 Honored Educator

CH234-ED-X

A Pictorial Guide to Chest Computed Tomography for Frequent Diseases and Daily Practice

All Day Room: CH Community, Learning Center

Participants

Philippe Khafagy, MD, Montfermeil, France (*Presenter*) Nothing to Disclose
Milan Najdawi, MD, Montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Mathilde Aissaoui, MD, Montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Maxime Benhamou, MD, Montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Karen Safar, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Mohamed Aziz Benlamine, MD, montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Mohamed Mehdi Gandoura, MD, Montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Kawthar B. Tleti, Ile de france, France (*Abstract Co-Author*) Nothing to Disclose
Nesrine Mrabet, MD, montfermeil, France (*Abstract Co-Author*) Nothing to Disclose
Pierre Y. Brillet, MD, PhD, Bobigny, France (*Abstract Co-Author*) Nothing to Disclose
Michel Cymbalista, MD, Montfermeil, France (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To learn typical and less common signs of frequent pulmonary chest diseases seen in daily practiceTo learn frequent pitfalls concerning these signsTo review major differential diagnoses

TABLE OF CONTENTS/OUTLINE

1. Commons signs in pulmonary infection : frequent differential diagnosis, pitfalls and key points2. Less common and unsual signs in pulmonary infection : frequent differential diagnosis, pitfalls and key points.3. Typical and les common signs in smoking related COPD : pitfalls, frequent differential diagnosisand key points.4. Typical and les common signs in acute pulmonary Oedema : frequent differential diagnosis and key points.5. Typical and les common signs in pulmonary sarcoidosis : frequent differential diagnosis and key points.6. 5. Typical and les common signs in pulmonary fibrosis : pitfalls, frequent differential diagnosis and key points.

CH235-ED-X

Pulmonary Vascular Complications of Portal Hypertension: Emphasis on CT Imaging

All Day Room: CH Community, Learning Center

Participants
Rashmi S. Katre, MBBS, San Antonio, TX (*Presenter*) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To describe the pathophysiology, clinical implications and imaging features and of pulmonary vascular complications of portal hypertension with emphasis on computed tomography (CT)

TABLE OF CONTENTS/OUTLINE

Pulmonary vascular complications of portal hypertension (PH) include hepatoportal syndrome (HPS), spontaneous porto-pulmonary venous anastomosis (PPVA) and portopulmonary hypertension. Portopulmonary collaterals, also PPVA, are those that connect with the pulmonary circulation in the setting of cirrhosis and PH. The HPS is characterized as the triad of liver disease, pulmonary gas exchange abnormalities leading to arterial deoxygenation and evidence of intrapulmonary vascular dilatations. CT may demonstrate dilated vessels with an increased number of terminal branches extending to the pleura and can be useful in distinguishing it from other causes of hypoxemia such as pulmonary fibrosis. Causes of pulmonary hypertension in the setting of PH may be thromboembolic or plexogenic. Characteristic CT features of chronic pulmonary arterial hypertension are the diameter of main pulmoanry artery which exceeds that of the ascending aorta; dilatation of the right and left main pulmonary arteries; abrupt narrowing and tapering of the peripheral pulmonary vessels; right ventricular hypertrophy; and right ventricular and atrial enlargement

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator

CH236-ED-X

The Wide Spectrum of Viral Pneumonias in Adults. Clinical Manifestations and Radiologic Findings with Emphasis on MDCT

All Day Room: CH Community, Learning Center

Participants

Jose Gutierrez Chacoff, MD, Santiago, Chile (*Presenter*) Nothing to Disclose
Freddy A. Jalil, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Veruska de Luccas, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Nicolas A. Zugbe, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Jorge Ortiz Vega, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Alberto J. Rojas Astorga, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Cristian Varela, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Francisca Leiter, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Viral pneumonias are a growing entity. The appearance of specific diagnostic tests and the down of bacterial pneumonia due to vaccination make this entities gain relevance.Viral pneumonias have variable clinical manifestations, and may present normal or inconclusive radiography at the beginning, which represent a diagnostic challenge. MDCT have gained special importance to characterize viral pneumonias and propose an adequate differential diagnose. Also there is some critical clinical information that could help the radiologist to reach a more accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

- Academinal aims- Introduction- Study methods- from viral damage to MDCT findings- Specific agentso Influenzao Parainfluenzao Respiratory syncytialo Hantao Varicellao Cytomegaloviruso Epstein Barro Adenovirus o Measleso Rhinoviruso Enteroviruso Coronaviruso Herpes simplex- Schematic diagnostic approach- Tips for a good report- Messages to take home

CH289-ED-X

Congenital Malformations of the Pulmonary Vessels in Adults

All Day Room: CH Community, Learning Center

Awards
Certificate of Merit

Participants
Maria Magdalena Serra Salas, MD, Barcelona, Spain (*Presenter*) Nothing to Disclose
Eva Castaner, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Xavier Gallardo, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Marta Andreu, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Joseph M. Mata, MD, PhD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Carlota C. Rodriguez, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Carles G. Zaragoza, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To recognize the radiographic findings to avoid misdiagnosis. To learn the imaging techniques and optimal reconstructions for their evaluation. To know the clinical impact and possible treatment of these abnormalities.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION: congenital lesions are usually characterized with contrast-enhanced axial CT imaging with coronal, sagittal, and 3D reformatted images. **REVIEW OF IMAGING FINDINGS: 1. Pulmonary artery:** Proximal interruption or absence of the main pulmonary artery, Anomalous origin of the left pulmonary artery from the right pulmonary artery (pulmonary artery sling) Idiopathic dilation of the pulmonary trunk Pulmonary valve stenosis**2. Pulmonary veins:** Stenosis and atresia Partial anomalous pulmonary venous drainage - Hypogenetic lung syndrome (Scimitar syndrome)
- Partial anomalous pulmonary venous return: Isolated or with congenital heart disease Meandering pulmonary vein Varicose pulmonary veins**3. Combined pulmonary arterial and venous anomalies** Pulmonary arteriovenous malformations.**4. Systemic arteries:** Bronchopulmonary sequestration Isolated systemic arterial supply of the lung**SUMMARY**

ED030

CME Learning Checkpoint Exhibit ED030 (Anastomotic Airway Complications after Lung Transplant: Clinical, Bronchoscopic and CT Correlation)

All Day Room: Case of Day, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants

Kyle Luecke, MD, Tampa, FL (*Presenter*) Nothing to Disclose
Andres Pelaez, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose

ED003-SU

Chest Sunday Case of the Day

Sunday, Nov. 27 7:00AM - 11:59PM Room: Case of Day, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants

Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
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Graham M. Wallace, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
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Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC
Agustina Agnetti, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lekshmi Santhosh, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) To analyze interesting chest cases. 2) To understand appropriate differential diagnosis. 3) To understand the clinical significance of the diagnosis presented.

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Santiago E. Rossi, MD - 2015 Honored Educator
Travis S. Henry, MD - 2016 Honored Educator

SSA05

Chest (Dual Energy/Radiomics)

Sunday, Nov. 27 10:45AM - 12:15PM Room: S404CD

CH CT

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

Participants
Mannudeep K. Kalra, MD, Boston, MA (*Moderator*) Technical support, Siemens AG; Technical support, Medical Vision
Satinder P. Singh, MD, Birmingham, AL (*Moderator*) Nothing to Disclose

Sub-Events

SSA05-01 Dual Energy CT Pulmonary Angiography (CTPA) in 1120 Patients with Suspected Pulmonary Embolism: Why Things Go Wrong?

Sunday, Nov. 27 10:45AM - 10:55AM Room: S404CD

Participants
Alexi Otrakji, MD, Boston, MA (*Presenter*) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (*Abstract Co-Author*) Technical support, Siemens AG; Technical support, Medical Vision
Efren J. Flores, MD, 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
Subba R. Digumarthy, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Rodrigo Canellas, MD, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine reasons for suboptimal CTPE examinations performed on dual energy scanners (DE-CTPA) in suspected pulmonary embolism.

METHOD AND MATERIALS

Our IRB approved HIPAA compliant study included 1251 consecutive DE-CTPA exams performed in 1120 patients (M: F 502:618, mean age 60±17 years, 81±35kg) scanned on dual source MDCT (Somatom Definition Flash, Siemens) or single source 64-row MDCT (GE 750HD Discovery, GE). All exams were performed with identical contrast volume, concentration and rate of injection using bolus tracking technique at a threshold of 100 HU in the right ventricle. Structured radiology report template was used for determination of suboptimal and optimal examination for evaluation of pulmonary embolism. Information regarding artifacts (motion, metal, beam hardening), patient weight, location of region of interest (ROI) for bolus tracking, and pulmonary arterial enhancement were assessed for all suboptimal studies. The presence of pulmonary embolism (PE) was recorded in all cases. Statistical analysis was performed with Fisher's exact test.

RESULTS

Suboptimal studies were reported in 80/1251 (6%) studies. Of these, 14/80 (17%) were suboptimal at all levels of pulmonary arteries, and 66/80 (83%) were suboptimal at main (8%), lobar (18%) and segmental (78%) levels. A combination of two or more causes was recorded in 37% of all non-diagnostic CTPA. Most common causes of non-diagnostic DE-CTPA at all levels of pulmonary arteries were bolus timing (57%) , large body habitus (43%) (mean weight 144±44 kg), incorrect scanning technique (35%) and severe motion artifacts (21%).Most common causes of partial non-diagnostic DE-CTPA were mild to moderate respiratory motion artifacts (55%) ,large body habitus (39%) (mean weight 138±40 kg), incorrect scanning techniques (26%), beam hardening and metal artifacts (14 %), and bolus timing (8%). PE was diagnosed in 6 partial non-diagnostic exams. Respiratory motion artifacts were significantly more common in single source than dual source dual energy CT (p=0.0001).

CONCLUSION

Respiratory motion artifacts, incorrect scan techniques, and large body habitus are the main causes of suboptimal DE-CTPA examinations.

CLINICAL RELEVANCE/APPLICATION

Suboptimal DE-CTPA can occur if attention is not given to scan techniques and breath-hold. Patients with large body habitus should be scanned with substantial protocol modifications for DE-CTPA or with single energy CTPA protocols.

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Subba R. Digumarthy, MD - 2013 Honored Educator

SSA05-02 Prediction of Incomplete Resolution of Acute Pulmonary Embolism (PE) by Dual Energy Computed Tomography (DECT) Pulmonary Blood Volume (PBV) Measurements

Sunday, Nov. 27 10:55AM - 11:05AM Room: S404CD

Participants
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sarah L. Sheard, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

Charlie Sayer, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Konstantinos Stefanidis, MD, PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sam Dumonteil, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ioannis Vlahos, MRCP, FRCR, London, United Kingdom (*Presenter*) Research Consultant, Siemens AG; Research Consultant, General Electric Company;
Brendan P. Madden, MBBCh, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine whether DECT PBV defect patterns can predict incomplete PE resolution or residual PBV defects at follow up DECT.

METHOD AND MATERIALS

56 patients with an initial acute PE were identified from a 4yr retrospective review of patients with initial and follow up DECT imaging (100/Sn140kVp,refmAs 150/128,100 mls,5ml/s iohexol 300mgI/ml, Definition FLASH, Siemens). 9 patients (technical failures, apparent initial chronic thromboembolic disease) were excluded.On the initial 47 patient studies (23 male) the Qanadli score (QS), presence of main pulmonary artery (PA) PE or right cardiac strain signs were recorded. In each lobe the largest vessel division with occlusive or non-occlusive PE was recorded. PBV defects were categorised by 2 reader consensus in each lobe as triangular, non-triangular, or mixed in shape and homogeneous or heterogenous in density.The presence and extent of residual PE (rPE) and residual PBV defects (rPBV) were recorded on the follow up study and parameters predictive of rPE or rPBV were analysed (MWU test, Chi-Square).

RESULTS

rPE was present in 34% of follow-up studies and was not significantly related to days to follow up (mean 219 in rPE v 181 no rPE), age (53 v 54yrs) or initial QS (18 v 13). Initial main PA PE (44 v 23%) and right cardiac strain (50 v 26%) were non-significantly higher in rPE patients ($p>0.05$).At least one PBV defect pattern was present in 89% of initial studies. Well defined triangular homogeneous defects were present in 16/47 (34%) of initial cases, with rPE occurring in 75% vs 13% of cases without this pattern ($p<0.001$, Sens 75%, Spec 87%). Other PBV defect patterns did not predict rPE. Initial occlusive PE (81%) was the only other parameter that less strongly predicted rPE (42% v 0%, $p=0.02$, Sens 100%, Spec 29%).rPBV were present in 40% of cases with initial defects. rPBV were only associated with initial triangular homogeneous PBV defects (87.5% v 16% without, $p<0.001$). Initial occlusive PE demonstrated a trend towards rPBV association (47% v 11%, $p=0.06$).

CONCLUSION

Triangular homogenous PBV defects on initial CT appear the most accurate predictor of residual PE and PBV defects at follow-up CT.

CLINICAL RELEVANCE/APPLICATION

A DECT PBV defect pattern may identify which acute PE patients are at risk of residual PE (and hence potential chronic thromboembolic pulmonary hypertension) which current CT criteria do not provide.

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

SSA05-03 Dual Energy Spectral CT for Assessing Degrees of Malignancy between Pure and Partially Invasive Lung Adenocarcinoma Based on IASLC/ATS/ERS Classification

Sunday, Nov. 27 11:05AM - 11:15AM Room: S404CD

Participants
Chenglong Ren, Shanxi, China (*Presenter*) Nothing to Disclose
Dong Han, MA, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Chuangbo Yang, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Fabao Gao, MD, PhD, Chengdu, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the value of dual energy spectral CT in assessing the degrees of malignancy of invasive lung adenocarcinoma.

METHOD AND MATERIALS

We retrospectively analyzed the dual-phase contrast enhanced spectral CT images of 65 cases of pathologically confirmed lung invasive adenocarcinoma (IA) diagnosed from 2013 to 2015. The IAs were reclassified as pure invasive (group A, n=27) and partially invasive (group B, n=38) based on IASLC/ATS/ERS classification and malignant behavior by the Department of Pathology. IAs with a predominant invasive component less than half of the lepidic growth were classified as pure invasive lesions, and the ones with lepidic growth were considered as partially invasive ones. Iodine concentration (IC) for tumors was measured in pulmonary phase (PP) and arterial phase (AP) on the iodine-based material decomposition images and normalized to that of aorta to obtain normalized IC (NIC). The index of normalized iodine concentration was calculated using the formula: iNIC=NICap/(NICap+NICpp). Independent t-test was used to analyze the statistical difference. Values of the 2 groups were compared and ROC study was performed to assess the differential diagnosis performance.

RESULTS

The NIC and iNIC values in AP for group A were significantly higher than those for group B (0.21±0.06 vs. 0.15±0.03 for NIC; 0.14±0.04 vs. 0.09±0.05 for iNIC; both $p<0.05$), while the NIC value in PP for group A (1.30±0.15) was significantly lower than for group B (1.58±0.29). Using the index of normalized IC (iNIC) of 0.13 in AP as a threshold, one could obtain an area-under-curve of 0.92 for ROC study with sensitivity of 91.7% and specificity of 86.1% for differentiating pure invasive from partially invasive lung adenocarcinoma.

CONCLUSION

Quantitative parameters obtained in spectral CT in the arterial phase provide high sensitivity and specificity for differentiating pure invasive lung adenocarcinomas from partially invasive one.

CLINICAL RELEVANCE/APPLICATION

Quantitative iodine concentration measurement in spectral CT may be used to improve accuracy for assessing the degrees of malignancy for invasive lung adenocarcinoma.

SSA05-04 Dual Energy Computed Tomography for Treatment Monitoring of Patients with Chronic Thromboembolic Pulmonary: Histogram Analysis of Lung Perfused Blood Volume Images

Sunday, Nov. 27 11:15AM - 11:25AM Room: S404CD

Participants
Hideki Ota, MD, PhD, Sendai, Japan (*Presenter*) Nothing to Disclose
Koichiro Sugimura, MD,PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Junya Tominaga, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Hidenobu Takagi, MD, PhD, Morioka, Japan (*Abstract Co-Author*) Nothing to Disclose
Katharina Otani, PhD, Tokyo, Japan (*Abstract Co-Author*) Employee, Siemens AG
Kei Takase, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate correlation between voxel-based histogram analysis of lung perfused blood volume (LPBV) data acquired by dual-energy computed tomography (CT) and right heart catheter (RHC) findings before and after balloon pulmonary angioplasty (BPA) for chronic thromboembolic pulmonary hypertension (CTEPH).

METHOD AND MATERIALS

This institutional review board-approved prospective study included twelve consecutive patients (men, 2, women, 10) with CTEPH who underwent BPA procedures. Informed consent was obtained from all patients. Serial CT examinations before and after BPA were acquired. Contrast-enhanced LPBV images were acquired in pulmonary arterial phase using a second-generation dual-source CT scanner. Whole volume data of LPBV for the bilateral lung parenchyma were extracted and frequency distribution of voxel values were generated. Pulmonary vascular resistance (PVR) and mean pulmonary artery pressure (mPAP) were measured before and after BPA. Histogram analysis parameters were correlated with RHC findings using Pearson's correlation coefficients. $P < 0.05$ indicated statistical significance.

RESULTS

BPA significantly improved PVR (mean, 532.8dyn·s/cm5 vs. 339.0dyn·s/cm5, $p<0.01$) and mPAP (mean, 35.0mmHg vs. 24.5mmHg, $p=0.01$). Frequency distributions of LPBV values appeared non-normal. At baseline, the mode and the 75th, 90th and 95th percentile of the histograms showed negative correlations with mPAP ($r= -0.62$ and $p=0.03$, $r= -0.59$ and $p=0.04$, $r= -0.64$ and $p=0.02$, $r= -0.66$ and $p=0.02$, respectively); the mode and the 90th and 95th percentile of the histograms showed marginal correlation with PVR ($r= -0.53$ and $p=0.08$, $r= -0.51$ and $p=0.08$, $r= -0.56$ and $p=0.06$, respectively). However, changes of the parameters after BPA were marginally correlated only in the following: changes of the 90th and 95% percentiles of the histograms and changes of PVR ($r-0.53$ and $p=0.08$, $r=0.55$ and $p=0.06$, respectively). The mean or standard deviations of the CT values in LPBV were not correlated with RHC findings.

CONCLUSION

Based on non-normal distribution of LPBV values, histogram parameters indicate the severity of CTEH as determined by RHC at the baseline. However, its use for monitoring treatment effect of angioplasty procedure is limited.

CLINICAL RELEVANCE/APPLICATION

Histogram analysis of lung perfused blood volume imaging obtained by dual-energy CT allows for estimation of clinical severity in chronic thromboembolic pulmonary hypertension before angioplasty.

SSA05-05 Radiomic Biomarkers for Predicting Progressive-free Survival of Patients with Rheumatoid Arthritis-Associated Interstitial Lung Disease

Sunday, Nov. 27 11:25AM - 11:35AM Room: S404CD

Participants
Chinatsu Watari, MD, boston, MA (*Presenter*) Nothing to Disclose
Radin A. Nasirudin, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Toru Hironaka, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Janne J. Nappi, PhD, Boston, MA (*Abstract Co-Author*) Royalties, Hologic, Inc.; Royalties, MEDIAN Technologies;
Shoji Kido, MD, PhD, Ube, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Yoshida, PhD, Boston, MA (*Abstract Co-Author*) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

PURPOSE

To identify radiomic features of thin-section lung CT images which predict progression-free survival (PFS) of patients with rheumatoid arthritis-associated interstitial lung disease (RA-ILD).

METHOD AND MATERIALS

Twenty patients with RA-ILD who underwent thin-section lung CT and serial pulmonary function tests were retrieved retrospectively. For each patient, ILD was considered as progressed if the forced vital capacity declined more than 10%. The PFS of the patient was determined as the time from the CT scan until either progression or death occurred. We dichotomized the censored survival data using a cutoff time of 3 years, which is considered as a relevant PFS time for RA-ILD patients. A single observer extracted 951 regions of interests (ROIs) that delineated the diseased lung areas on the CT images, and the following radiomic features were computed: homogeneity, dissimilarity, contrast, entropy, energy, sum variance, difference variance, mean,

second moments, autocorrelation, correlation, cluster shape, and cluster prominence. ROC analysis was employed to determine an optimal cut-off value that divides the patients into surviving and non-surviving groups for each radiomic feature, and its value in predicting 3-year survival was assessed by Kaplan-Meier survival analysis with log-rank test. Also, a random forest classifier was trained using leave-one-patient-out method to combine all the radiomic features into a single index, and its predictive value was evaluated using accuracy and area under the ROC curve (AUC).

RESULTS

Mean duration of follow up was 1012 days. Ten subjects showed disease progression or died. Optimal cut-off values (p-value) for the 4 representative radiomic features were: contrast: 102.15 (p=0.42), dissimilarity: 7.98 (p=0.045), homogeneity: 0.25 (p=0.44), and entropy: 6.11 (p=0.88). A combined radiomic feature by random forest yielded an accuracy of 0.70 [95% CI: (0.46, 0.88)] and ACU of 0.64 [0.40, 0.89] in predicting 3-year PFS.

CONCLUSION

Radiomic features, in particular, the dissimilarity feature that showed statistical significance, are a potentially effective biomarker for predicting of the 3-year PFS of patients with RA-ILD.

CLINICAL RELEVANCE/APPLICATION

Radiomic features can provide an effective prognostic imaging biomarker of patients with RA-ILD, which benefits precise management of the disease.

SSA05-06 A Combination of Shape and Texture Features Enables Discrimination of Benign Fungal Infection from Non-small Cell Lung Adenocarcinoma on Chest CT

Sunday, Nov. 27 11:35AM - 11:45AM Room: S404CD

Participants
Mahdi Orooji, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose
Mehdi Alilou, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Niha G. Beig, MS,BEng, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Sagar Rakshit, MBBS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Prabhakar Rajiah, MD, FRCR, Dallas, TX (*Abstract Co-Author*) Institutional Research Grant, Koninklijke Philips NV; Speaker, Koninklijke Philips NV
Michael Yang, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
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Robert C. Gilkeson, MD, Cleveland, OH (*Abstract Co-Author*) Research Consultant, Riverain Technologies, LLC; Research support, Koninklijke Philips NV; Research support, Siemens AG ; Research support, General Electric Company
Philip A. Linden, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Vamsidhar Velcheti, MD, St.Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Anant Madabhushi, PhD, Piscataway, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Histoplasmosis is the most common endemic fungal infection in the US. Granulomas secondary to histoplasmosis infection can radiographically appear identical to malignant lung nodules. In a CT screening study of the 51% of baseline screening CT scans found to be positive for lung nodules, only 1-2% were malignant, the remainder felt to be granulomas due to a prior histoplasmosis infection. The goal of this work is to show that a combination of computer extracted image texture and shape features of a nodule on a lung CT exam can enable accurate discrimination of fungal infection versus carcinomas on routine chest CTs. This work could pave the way for substantially reducing unnecessary surgical interventions that result in a diagnosis of histoplasmosis.

METHOD AND MATERIALS

From in vivo lung CTs of the patients who had surgical resection, we used two retrospective cohorts from two sites. Site 1 involved N=123 solitary nodules (66 carcinomas, 57 granulomas) employed for training the classifier and Site 2 involved N=56 independent testing nodules (34 carcinomas, 22 granulomas). Note that patients with multiple solitary nodules were excluded to allow accurate annotation. A total of 669 computer extracted texture and shape features were obtained from the manually delineated nodules from CT scans. Following feature extraction, the most discriminative features within the training cohort were determined via 3-fold cross validation and one-shot testing was performed on the independent testing cohort

RESULTS

The most discriminative features were sum of variance and skewness of Law features with area under the receiver operating characteristic curve (AUC) of 88% and 84%, respectively. Employing the trained diagnosis model on the independent cohort showed AUC as high as 71%.

CONCLUSION

The combination of computer extracted texture and shape features of nodules on a CT scan appear to distinguish granulomas from adenocarcinomas. By identifying the appropriate threshold at which the false omission rate was 0%, a positive predictive value of 62% was achieved on the validation set.

CLINICAL RELEVANCE/APPLICATION

A combination of shape and texture features of nodules on in vivo lung CT scans may allow for discrimination between benign infection and malignant lung nodules. This may potentially impact morbidity and healthcare cost of diagnosing lung cancer by reducing unnecessary bronchoscopy, biopsy, and surgery for benign fungal infections.

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/

Prabhakar Rajiah, MD, FRCR - 2014 Honored Educator

SSA05-07 CT Texture Analysis of Pulmonary Nodules in a Coffee-Break

Sunday, Nov. 27 11:45AM - 11:55AM Room: S404CD

Participants
Aambika Talwar, MA, MBBCHIR, Oxford, United Kingdom (*Abstract Co-Author*) Research funded, Mirada Medical Ltd
Julien M. Willaime, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd
Lyndsey C. Pickup, MEng, DPhil, Oxford, United Kingdom (*Abstract Co-Author*) Former Employee, Mirada Medical Ltd; Employee, Optellum Ltd
Monica Enescu, DPhil,MSc, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd
Djamal Boukerroui, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd.
William Hickes, MSc, Oxford, United Kingdom (*Abstract Co-Author*) Research Grant, Mirada Medical Ltd
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Timor Kadir, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd.
Fergus V. Gleeson, MBBS, Oxford, United Kingdom (*Presenter*) Consultant, Alliance Medical Limited Consultant, Blue Earth Diagnostics Limited Consultant, Polarean, Inc

PURPOSE

CT Texture analysis (CTTA) has been shown to be a potential imaging biomarker of malignancy. The aims of this study were to assess the reproducibility of texture features extracted from pulmonary nodules (PNs) and compare this to the inter-scan variability of volume measurements, which can vary by up to 25% (Gietema et al 2007).

METHOD AND MATERIALS

19 patients, (11 with indeterminate PN(s) and 8 with pulmonary metastases) underwent two Low Dose Volumetric 'Coffee-break' CT scans within a 60 minute period.CTTA and nodule volume, computed on a contour generated using a semi-automatic Otsu thresholding method, were measured for one solid PN per patient, including nodules abutting vessels or pleura.20 texture features including Haralick, LoG and Gabor features, basic statistics and fractal dimensions previously used to predict a nodule probability of malignancy were extracted from each contoured region. The variability of textural measurements within individual nodules was assessed by computing the relative differences between baseline and validation scans. Mean and standard deviation (std) were estimated from the relative differences.Lower and upper limits of repeatability (LLR & ULR) were calculated as mean ± 1.96 × std. In addition, the intra-class correlation coefficient (ICC) was also used to assess the repeatability of the image features for the group of patients included in this study.Full Research Ethics Approval was obtained to undertake this study.

RESULTS

Nodule volumes ranged from 76 to 1389 mm3, (mean 2D diameter 8.1mm; std 2.3).Mean difference in volume between the two scans was 18.40mm3 (4.64%, std 22.7), but this was not statistically different (p-value = 0.75 Wilcoxon rank sum test).95% of textural features displayed ULR & LLR below ±29% (std ≤ 14%). These measurements were less variable than nodule volume (mean = 4.0%; std = 16.3%; LLR = -27.9%; ULR = 35.8%). All features had high repeatability (0.82 ≤ ICC ≤ 0.98).

CONCLUSION

Textural features were found to be more stable than the automatic volumetric measurements. However, editing the volumes might produce better consistency.

CLINICAL RELEVANCE/APPLICATION

CTTA has previously been proposed to predict nodule malignancy on Chest CT. Repeatability of these measurements is an essential step in ensuring CAD systems provide reliable results.

SSA05-08 CT Based Radiomics Approach for Differentiation of Metastatic from Non-metastatic Lymph Node in Patients with Primary Lung Adenocarcinoma

Sunday, Nov. 27 11:55AM - 12:05PM Room: S404CD

Participants
Ying Liu, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
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Zhao Xiang Ye, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Robert J. Gillies, PhD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
John A. Arrington, MD, Tampa, FL (*Presenter*) Nothing to Disclose

PURPOSE

To determine the diagnostic performance of computed-tomography (CT) based radiomics approach for differentiation between metastatic and non-metastatic lymph nodes in patients with lung adenocarcinomas.

METHOD AND MATERIALS

Institutional review board approval was obtained for this retrospective study, and the requirement for patients' informed consent was waived. A total of 108 patients with lung adenocarcinoma who underwent preoperative CT scans (both pre- and post-contrast enhanced), and then received surgical resection with systematic lymph node dissection were enrolled in this study. 295 lymph nodes with short-axis diameter of 5 mm or larger on axial CT images were analyzed. Each lymph node was manually segmented and 43 quantitative computerized features were quantitatively extracted by using custom metrics implemented in MATLAB; meanwhile,

10 conventional CT features (semantic features) were evaluated by radiologists. These findings were correlated to the gold standard of pathology. Statistical evaluation was performed on a per-nodal basis. Multiple logistic regression analyses were performed to identify independent factors of indicating nodal malignancy.

RESULTS

Eight semantic features and twenty-four computerized features were significantly associated with nodal malignancy. On multivariate analysis, the model with combined semantic features and computerized features showed excellent performance in differentiation between metastatic and non-metastatic lymph nodes, and the AUC (0.942) was significantly higher compared to the model with just semantic features (adjusted P=0.022) or the model with computerized features alone (adjusted P<0.00001). Using the optimal cutoff value for this best model, 111 of 134 metastatic lymph nodes and 148 of 161 non-metastatic lymph nodes were correctly diagnosed, and the sensitivity, specificity, accuracy, PPV and NPV were 82.8%, 91.9%, 87.8%, 89.5%, and 86.5%, respectively.

CONCLUSION

CT based radiomics approach has the potential ability to improve differentiation between metastatic and non-metastatic lymph nodes in lung adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION

CT based radiomics approach which combined semantic features and computerized features could serve as a non-invasive image biomarker for nodal malignance in patients with lung adenocarcinoma, and this modality can easily be added to clinical use without additional cost.

SSA05-09 Visual Assessment of Regional Xenon Ventilation, Perfusion, and Ventilation-Perfusion Mismatch using Dual-Energy Computed Tomography in COPD Patients: Follow-up Study after Pharmacological Treatment

Sunday, Nov. 27 12:05PM - 12:15PM Room: S404CD

Participants
Hye Jeon Hwang, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joon Beom Seo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Young Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Namkug Kim, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Stockholder, Coreline Soft, Inc
Taekjin Jang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jae Seung Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sei Won Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yeon-Mok Oh, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the interval change of regional ventilation (V) and perfusion (Q) status in COPD patients after pharmacological treatment using combined xenon-enhanced V and iodine-enhanced Q dual-energy CT (DECT).

METHOD AND MATERIALS

Twenty-three COPD patients were prospectively enrolled. Baseline combined V and Q DECT was performed after discontinuation of the medication. After a 3-month pharmacological treatment, follow-up combined V and Q DECT was performed. Virtual noncontrast (VNC) images, V maps, and Q maps were anatomically co-registered with in-house software. VNC, V maps and Q maps of follow-up images were registered to the baseline VNC images. For visual analysis, the regional disease patterns—emphysema, bronchial wall thickening, or normal looking parenchyma—in each segment was determined on VNC image of baseline image. And regional V/Qratio pattern of each segment was determined to be matched (-11), or reversed mismatched (V/Qratio<1) in both baseline and follow-up study.

RESULTS

Most of segments with normal parenchyma or emphysema showed the matched V/Qratio pattern (90.1% and 71.2%), whereas the segments with bronchial wall thickening commonly showed reversed mismatched pattern (66.7%) on baseline images. On follow-up, the regional V/Qratio pattern did not change in most of segments with matched V/Qratio (91.7%). In more than half of the segments with reversed mismatched V/Qratio (60.6%), V/Qratio pattern changed into the matched V/Qratio on follow-up. Pattern change from the reversed mismatched V/Qratio to the matched V/Qratio was more frequently seen in the normal looking parenchyma than in the diseased lung parenchyma ($p < 0.05$). In most of the area with mismatched V/Qratio, V/Qratio pattern did not changed (66.7%).

CONCLUSION

The recovery of V/Q abnormality after pharmacological treatment can be visualized with combined V and Q DECT imaging in COPD patients. The correction of V/Q abnormality in non-emphysematous areas may be associated with the response to pharmacological treatment in COPD patients.

CLINICAL RELEVANCE/APPLICATION

Visual assessment of the interval change of the regional V and Q status after pharmacological treatment with combined V and Q DECT imaging is feasible in COPD patients.

CH229-ED-SUA7

Double Ring Enhancement in the Aortic Wall: Imaging Appearances and Differential Diagnosis

Awards
Certificate of Merit

Participants
Ichiro Sakamoto, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Hironori Onizuka, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroki Nagayama, Shimabara, Japan (*Abstract Co-Author*) Nothing to Disclose
Hideyuki Hayashi, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Eijun Sueyoshi, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

TEACHING POINTSTo learn typical imaging appearances of double ring enhancement (DRE) in the aortic wall on contrast-enhanced CTTo learn differential diagnosis of this signTo learn clinical and imaging features of each disease entity showing this signTo learn management of each disease entity showing this sign

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Typical imaging appearances of DRE in the aorta 3. Atypical imaging appearances of DRE in the aorta 4. Differential diagnosis of DRE in the aorta (Takayasu arteritis, Giant cell arteritis, IgG4-related aortitis, Inflammatory abdominal aortic aneurysm, Malignant lymphoma, Infected aneurysm, Syphilis-associated aortitis) 5. Clinical and imaging features of each disease entity showing DRE 6. Management of each disease entity showing DRE 7. Summary *Please note, this exhibit is no longer part of the CME lunch time presentations, cannot recieve CME credit.*

CHS-SUA

Chest Sunday Poster Discussions

Sunday, Nov. 27 12:30PM - 1:00PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Beth Zigmund, MD, Haddonfield, NJ (*Moderator*) Consultant, BioVentrix, Inc

Sub-Events

CH237-SD-SUA1 Comparison of HRCT Appearances and Histopathologic Findings Following Transbronchial Lung Biopsy in Patients with Cryptogenic Organizing Pneumonia

Station #1

Participants
Ryoko Egashira, MD, Saga, Japan (*Presenter*) Nothing to Disclose
Kazuhiro Tabata, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Takahiko Nakazono, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Ken Yamaguchi, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaki Tominaga, MD,PhD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Irie, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuji Ishimatsu, MD,PhD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuto Ashizawa, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masahiro Takaki, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To identify features indicative of disease severity or associated with disease relapse in patients with cryptogenic organizing pneumonia (COP). HRCT, clinical and histopathologic findings were retrospectively compared in patients undergoing transbronchial lung biopsy.

METHOD AND MATERIALS

155 consecutive patients diagnosed with organizing pneumonia following TBLB were reviewed. 44 patients had a consensus multidisciplinary diagnosis of COP (male:female= 29:15), median age=68 years (range: 27-87). Pre-biopsy HRCT images were evaluated for the extent of airspace consolidation, ground-glass opacification (GGO), intralobular reticulation and emphysema, HRCT zonal predominance in both the vertical and axial plane and intralesional bronchiolar abnormalities such as irregular/smooth dilatation. The presence or absence of: a perilobular pattern, reversed halo sign, centrilobular nodules and pleural effusions were also documented. Change on serial imaging was classified according to: progression of a parenchymal lesion, residual GGO/parenchymal distortion/traction bronchiectasis, development of honeycomb-like appearances and complete resolution of the abnormality. Histological specimens were quantified for the amount of Masson bodies, airspace fibrin and eosinophils.

RESULTS

13 patients relapsed after treatment. Eccentric distribution of the disease in the vertical plane on HRCT was related to disease relapse (38% versus 0%, $P<0.05$). No other HRCT findings or clinical/histological parameters were significantly associated with disease relapse. Irregular dilatation of bronchi within the lesion on HRCT was significantly related to residual parenchymal distortion/traction bronchiectasis (67% versus 28%, $P<0.05$). No HRCT or clinical findings were significantly related to histological severity.

CONCLUSION

HRCT features may help identify those patients with COP that are likely to undergo disease relapse and indicate the subset of patients with COP, in whom parenchymal damage may not resolve.

CLINICAL RELEVANCE/APPLICATION

Patients with COP, where disease is asymmetrically distributed, being more extensive in either the upper or lower zones, may require closer monitoring and/or aggressive steroid therapy as they are more likely to undergo disease relapse.

CH238-SD-SUA2 CT Diagnosis for Thymic Epithelial Tumors: Correlation with the World Health Organization Histologic Classification system Updated in 2015 and New TNM Staging System

Station #2

Participants
Akiko Sumi, MD, Kurume, Japan (*Presenter*) Nothing to Disclose
Kiminori Fujimoto, MD, PhD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Asako Kuhara, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Naoko Ikehara, MD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryoji Iwamoto, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Shuji Nagata, MD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshi Abe, MD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the CT features with histological assessment of thymic epithelial tumors based on the new World Health Organization (WHO) histological classification updated in 2015 and recently proposed TNM staging, and to determine the CT features helpful in differentiating low-risk from high-risk tumors.

METHOD AND MATERIALS

This retrospective study included 132 patients with thymic epithelial tumor who underwent CT within 2 weeks before surgery. The patients were 74 women and 57 men (median age, 59 years; range, 24-82 years). CT features were classified into 18 categories and were assessed by two independent radiologists. These categories were correlated with the WHO histologic subtypes and the useful findings for predicting tumor invasiveness were assessed.

RESULTS

With WHO histologic classification, 132 tumors were regrouped into three categories: 62 low-risk thymomas (10 type A, 22 type AB, and 30 type B1), 39 high-risk thymomas (27 type B2 and 12 type B3), and 31 thymic carcinomas.There was statistically significant relationship between WHO histologic classification and tumor invasiveness ($P < .001$). There were 93 stage I, 3 stage II, 8 stage IIIa, 3 stage IIIb, 3 stage IVa, and 4 stage IVb patients. There was statistically significant difference in size between stage I and stage II-IV tumors ($P < .001$). Low-risk thymomas were more likely to have smooth contour, homogenous inner character, and homogenous contrast enhancement than high-risk thymomas and thymic carcinomas (all, $P < .001$).Thymic carcinomas were more likely to have necrotic/cystic component than thymomas ($P < .001$). The invasiveness of tumors were well-recognized by CT features, such as irregular contour, heterogenous inner component, heterogenous contrast enhancement, and waving boundary with vascular wall and lung surface.

CONCLUSION

CT characteristics of thymic epithelial tumors correlate with new WHO histologic classification, and it may be helpful in the classification of new TNM staging system.

CLINICAL RELEVANCE/APPLICATION

CT features suggestive of invasiveness in thymic epithelial tumor were irregular contour, heterogenous inner component, heterogenous contrast enhancement, and waving boundary with lung surface, and these features were correlated with new WHO histologic classification.

CH240-SD-SUA4 Imaging Genotyping for Functional Signaling Pathways in Lung Squamous Cell Lung Carcinoma using Radiomics Approach

Station #4

Participants
So Hyeon Bak, MD, Chuncheon-si, Korea, Republic Of (*Presenter*) Nothing to Disclose
Ho Yun Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyunjin Park, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Insuk Sohn, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seung-Hak Lee, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Keunchil Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yoon Ki Cha, MD, Goyang-si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Imaging features may be useful for identifying distinct genomic difference and may have predictive power for certain phenotypes attributed to genomic mutation. We aimed to identify association between computed tomography (CT) quantitative characteristics and pathway aberration of the lung squamous cell carcinoma (SCCs). We also aimed to find predictive imaging biomarker that underpin genomic signature and clinical outcomes in lung SCCs by means of a radiomics strategy.

METHOD AND MATERIALS

A total of 57 patients underwent surgical resection and whole-exome sequencing of DNA for lung SCCs were included in this retrospective study. Mutational profiles of core signaling pathways of lung SCCs were classified into five categories such as redox stress, differentiation, apoptosis, cell proliferation, and chromatin remodelers pathway. 65 quantitative imaging features was extracted from CT and 74 clinicoradiological features including 65 image features were classified into 8 categories such as clinical, physical, histogram-based, lung cancer-specific, shape, local, regional, and emphysema features.

RESULTS

The association between clinicoradiological features and alteration of core signaling pathway or survival was identified. Energy and right lung volume was significantly associated with alternation of redox stress and cell proliferation pathway ($p=0.026$, AUC=0.681; $p=0.030$, AUC=0.812). Mass and range was related to the apoptosis pathway ($p=0.009$, AUC = 0.860). None of the clinicoradiological features showed any significant association with the aberration of differentiation and chromatin remodelers pathway. The minimum value of tumor region was identified as independent prognostic factor ($p=0.014$).

CONCLUSION

This study identified that radiomics approaches in lung SCCs have the noninvasively potential to predict clinical outcome and alteration of core signaling pathway.

CLINICAL RELEVANCE/APPLICATION

The clinical benefit of quantitative imaging parameters may allow comprehensive evaluation of the molecular status and targetable pathway of lung SCCs that could be used for specific pathway targeted therapy.

CH119-ED-SUA5 Approach to Pulmonary Hypertension: From Imaging to Clinical Diagnosis

Station #5

Awards
Certificate of Merit
Identified for RadioGraphics

Participants

Felipe Aluja, MD, Bogota, Colombia (*Presenter*) Nothing to Disclose
Federico G. Diaz Telli, MD, Pilar, Argentina (*Abstract Co-Author*) Nothing to Disclose
Sebastian Yevenes Aravena, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Sreevathsan Sridhar, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To recognize the different types of pulmonary hypertension, the physiopathology and their clinical presentation. Describe the essential structures that all radiologist should look for in cases of pulmonary hypertension such as: parenchyma, bronchial arteries, pulmonary arteries and heart that may guide to an appropriate diagnosis. Review the key elements in regard to the imaging findings, that the radiologist have to look for in order to do an appropriate clinical approach to the diagnosis based on the imaging findings. Propose a simple check list for the approach to pulmonary hypertension that allows radiologists to classifying pulmonary hypertension disease based on imaging findings and may contribute for the clinical diagnosis of each subtype.

TABLE OF CONTENTS/OUTLINE

Introduction Clinical classification with brief but concise clinical presentation and physiopathology Classical signs in pulmonary hypertension in computed tomography, magnetic resonance imaging and echocardiography Essential structures to evaluate: Parenchyma Bronchial arteries Pulmonary arteries Heart Algorithm approach to pulmonary hypertension from the imaging to the clinical diagnosis Conclusion

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
Sanjeev Bhalla, MD - 2016 Honored Educator

CH178-ED-SUA6 Patterns of Drug-Related Pulmonary Injury: A Pictorial Review

Station #6

Participants
Linda DeMello, MD, Warwick, RI (*Presenter*) Nothing to Disclose
Saurabh Agarwal, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Michael K. Atalay, MD, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Thomas K. Egglin, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Terrance T. Healey, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: To review the pathophysiology of drug-induced pulmonary injury.
To briefly discuss the myriads of agents which may cause lung injury (i.e. cardiovascular meds, chemotherapeutics, antibiotics, immunosuppressants and street drugs) To present a series of cases from our institution of various drug-induced pneumonitides and their various manifestations. To discuss the importance of recognizing these patterns and potential causes of injury as the majority are reversible and further exposure may result in death.

TABLE OF CONTENTS/OUTLINE

Pathophysiology of drug-induced lung injuryVarious medications that may cause lung injury (with emphasis on the most common)Review of cases and imaging findings (predominately radiographs and chest CTs)OutcomesSummary

CHS-SUB

Chest Sunday Poster Discussions

Sunday, Nov. 27 1:00PM - 1:30PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Beth Zigmund, MD, Haddonfield, NJ (*Moderator*) Consultant, BioVentrix, Inc

Sub-Events

CH241-SD-SUB1 Diabetes and Mortality in the National Lung Screening Trial

Station #1

Participants
Janet Snell-Bergeon, PhD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Kavita Garg, MD, Denver, CO (*Presenter*) Nothing to Disclose
Samuel Chang, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Nayana U. Patel, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Satish K. Garg, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Presence of diabetes increases mortality, but extent to which diabetes increases lung and other cancer mortality among heavy smokers is unclear. We examined the risk for all-cause, lung cancer and non-lung cancer mortality among people with vs without diabetes followed in the National Lung Screening Trial (NLST) cohort.

METHOD AND MATERIALS

There were 53,212 participants enrolled in the NLST trial, and 5,174 reported having diabetes at screening. Over the course of the study, there were 3,936 total deaths, 1021 from lung cancer and 826 non-lung cancer. Cox proportional hazards regression models were used to examine the relative risk for overall, lung cancer and non-lung cancer mortality associated with diabetes, adjusted for age, gender, randomization group and covariates of interest (body mass index [BMI] and pack-years of smoking).

RESULTS

Subjects with diabetes were older (62±5 vs. 61±5 years, p<0.0001), reported more pack-years of smoking (62±29 vs. 55±23, p<0.0001, and had higher BMI (31.1±5.8 vs 27.6 ± 4.9, p<0.0001) than people without diabetes at screening. There were 650 deaths (12.6%) among participants with diabetes, vs 3,286 deaths (6.8%) among non-diabetic subjects (p<0.0001). In cox proportional hazards models, diabetes was associated with an increased risk for all-cause mortality (RR=2.2, 95% CI 1.8-2.6, p<0.0001), lung cancer mortality (RR=1.8, 95% CI 1.3-2.5, p=0.0008) and non-lung cancer mortality (RR 1.6, 95% CI 1.04- 2.3, p=0.03) in women. Among men, diabetes increased the risk only for all-cause (RR=1.7, 95% CI 1.5–1.9, p<0.0001) and non-lung cancer mortality (RR=1.68 (95% CI 1.3-2.0, p<0.0001), but not lung cancer (RR=1.1, 95% CI 0.8-1.4, p=0.63).

CONCLUSION

Diabetes increases the risk of death from all causes and non-lung cancer deaths among heavy smokers, and increases the risk for lung cancer mortality in women.

CLINICAL RELEVANCE/APPLICATION

Heavy smokers with diabetes are at increased risk for mortality from cancer at sites other than the lung in men and both lung and non-lung cancers in women compared to non-diabetic subjects.

CH242-SD-SUB2 Thoracic Aortic Size by Race and Sex in a Community Dwelling Cohort: Results from the CARDIA Study

Station #2

Participants
Andrew E. Kott, MD, Nashville, TN (*Presenter*) Nothing to Disclose
Edmond K. Kabagambe, DVM,PhD, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
David R. Jacobs Jr, PhD, Minneapolis, MN (*Abstract Co-Author*) Nothing to Disclose
Joseph Yeboah, MD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose
James G. Terry, MS, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose
John J. Carr, MD, MS, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Norrina B. Allen, PhD, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Yaorong Ge, PhD, Winston Salem, NC (*Abstract Co-Author*) Nothing to Disclose
Steve Sidney, MD, MPH, Oakland, CA (*Abstract Co-Author*) Nothing to Disclose
David C. Goff, MD,PhD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Limited data on the size distribution of the thoracic aorta (Ao) in middle adult life is available; however, thoracic Ao aneurysm and dissection are a major cause of clinical disease. Non-contrasted, gated cardiac computed tomography (CCT) can be used to provide information about Ao size. In this study, we measured thoracic Ao size with CCT in community-dwelling black and white participants in the CARDIA study.

METHOD AND MATERIALS

1,287 participants who completed thin-slice (<1 mm) CCT of the thoracic Ao during the CARDIA year 25 exam (Y25, 2010-11) were

1,267 participants who completed thin slice (<1 mm) CCT of the thoracic Ao during the CARDIA year 25 exam (Y25, 2010-11) were included. A 3D modeling program was used to provide measures of Ao cross-sectional area (mm2) and average diameter (mm) perpendicular to the vessel centerline at 14 locations in 4 Ao segments [root (3), ascending (3), arch (3), and descending (5)]. Demographics and clinical data were obtained at the same exam. The associations of various parameters with Ao size were assessed using multivariable linear models that accounted for potential confounders and mediating risk factors. Hypertension (HTN) was defined by medication use or BP≥140/90.

RESULTS

Mean(SD) age for participants was 49.9(3.7) years, 54.5% were female, and 53.5% were black. Mean(SD) BMI was 30.5(7.2) kg/m2, 19.3% were current smokers, 13.7% had diabetes, 27.9% were treated for HTN, and 16.2% were treated for dyslipidemia. Male Ao were larger than those of females (Table). When comparing white and black race, whites had a larger Ao root and ascending Ao, and blacks had a larger Ao arch and descending Ao (Table). Participants with HTN compared with those without HTN had larger ascending [33.9(0.7) vs. 32.8(0.7)mm], arch [29.7(0.5) vs. 28.9(0.5)mm] and descending thoracic Ao [24.4(0.4) vs. 23.9(0.4)mm] diameters with all comparisons p<0.001. There was no difference in Ao root size (p=0.75) in participants with and without HTN.

CONCLUSION

Sex, race and HTN were associated with differences in mean Ao size. Compared to sex differences, race and HTN differences were relatively small (≤1.0mm). Ao imaging with CCT can be performed with a high degree of precision evidenced by our narrow standard errors in the study.

CLINICAL RELEVANCE/APPLICATION

Thoracic Ao site-specific sex and race differences were demonstrated in this study. The association between HTN and Ao size was most prominent in sites not well visualized by trans-thoracic echocardiography.

CH243-SD-SUB3 Histogram Analysis of Apparent Diffusion Coefficient for Non-Small Cell Lung Cancer: Prediction of Tumor Grade, Lymphovascular Invasion, and Pleural Invasion

Station #3

Participants
Naoko Tsuchiya, Kahoku, Japan (*Presenter*) Nothing to Disclose
Mariko Doai, Ishikawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Hisao Tonami, MD, Kahoku, Japan (*Abstract Co-Author*) Nothing to Disclose
Katsuo Usuda, Kahoku, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the application of histogram analysis of apparent diffusion coefficient (ADC) value in determining tumor grade, lymphovascular invasion, and pleural invasion of non-small cell lung cancer (NSCLC).

METHOD AND MATERIALS

The study included sixty patients with surgically diagnosed NSCLC. Diffusion-weighted MR imaging (DWI) was performed in the axial plane using a spin-echo, echo-planar imaging sequence with respiratory triggering by navigator-echo method (b=0 and 800 sec/mm²). Calculated ADC maps were generated, and placed a 3-D volume-of-interest (VOI) on the tumor superimposing low b-value DWI. All ADC values within the VOI were used to compute the average ADC of the tumor. The ADC values were binned to construct the histogram. Using the histogram, mean, minimum, maximum, skewness, kurtosis, and percentiles (5th- 95th) of ADC of the entire tumor were computed. Histogram parameters were correlated with tumor grade, lymphovascular invasion, and pleural invasion. Receiver operating characteristic (ROC) analysis was performed for assessing diagnostic performance of histogram parameters in distinguishing different pathologic features.

RESULTS

The mean, maximum, 10th, 25th, 50th, 75th, 90th, and 95th percentiles of ADC showed significant differences among the pathological tumor grades. The 95th percentile of ADC achieved the highest area under curve (AUC), with a cut-off value of 0.001634mm²/sec and sensitivity and specificity of 0.846 and 0.667, respectively. The mean, skewness, kurtosis, 50th, 75th, 90th, and 95th percentiles of ADC showed significant difference between lymphovascular invasion subgroup. Kurtosis achieved the highest AUC, with a cut-off value of 1.081 and sensitivity and specificity of 0.612 and 0.909, respectively. The skewness showed significant difference between pleural invasion subgroup. For skewness, a cut-off value of 0.824 was associated with pleural invasion with sensitivity of 0.600 and specificity of 0.733.

CONCLUSION

ADC histogram analysis on the basis of the entire tumor volume is useful for predicting tumor grade, lymphovascular invasion, and pleural invasion of NSCLC.

CLINICAL RELEVANCE/APPLICATION

ADC histogram analysis on the basis of the entire tumor volume is useful for predicting tumor grade and aggressiveness of non-small cell lung cancer.

CH118-ED-SUB5 Non Thrombotic Pulmonary Arterial Filling Defects And Occlusion-A Differential Every Radiologist Should Know

Station #5

Participants
Thomas Capobres, MD, Detroit, MI (*Presenter*) Nothing to Disclose
David L. Spizarny, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Chad Klochko, MD, Farmington Hills, MI (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To review the differential for non-thrombotic causes of pulmonary arterial emboli and occlusion, highlighting characteristic imaging

To review the differential for non-thrombotic causes of pulmonary arterial emboli and occlusion, highlighting characteristic imaging features as well as historical and clinical manifestations. To understand potential treatment approaches for different types of non-thrombotic pulmonary artery emboli/occlusion. To recognize potential complications related to different types of non-thrombotic pulmonary artery emboli/occlusion.

TABLE OF CONTENTS/OUTLINE

CT imaging of the pulmonary arteries and normal anatomy Nonthrombotic causes of pulmonary arterial filling defects and occlusion: characteristic imaging features, patient history and clinical manifestations, treatment approach/outcome, potential complications Extrinsic compression Mediastinal fibrosis Tumor Bronchogenic carcinoma Lymphadenopathy/metastatic Intrinsic filling defects Tumors Pulmonary artery sarcoma Intravascular metastases Endogenous emboli Septic Fat Amniotic fluid Exogenous emboli Vertebroplasty cement/barium IVC filter strut Prostate seeds Metallic Mercury Talc Catheter/Wire Buckshot Iatrogenic air Pseudo Emboli Bronchial artery to pulmonary artery fistula Summary

CH186-ED-SUB6 An Algorithm to Occupational Lung Disease: A Way to Make it Easy

Station #6

Participants
Felipe Aluja, MD, Bogota, Colombia (*Presenter*) Nothing to Disclose
Federico G. Diaz Telli, MD, Pilar, Argentina (*Abstract Co-Author*) Nothing to Disclose
Sebastian Yevenes Aravena, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To recognize the different types of occupational lung disease, their clinical presentation, causes and possible treatment. Describe the imaging findings associated with occupational lung disease, their appearance in conventional radiology and computed tomography. Review the key elements in regard to the imaging diagnosis, focusing on their characteristics, distribution, associated findings and some others needed for an adequate diagnosis. Propose a simple algorithm for the occupational lung disease based on imaging findings.

TABLE OF CONTENTS/OUTLINE

Introduction Clinical characteristics of occupational lung disease Silicosis Classic silicosis Simple form and complicated form Acute silicosis Coal worker pneumoconiosis Siderosis Berylliosis Talcosis Hard metal pneumoconiosis Arc welder lung Asbestos related disease Parenchymal Pleural Asbestosis Hypersensitivity pneumonitis Flavor´s worker lung Algorithm approach to occupational lung disease Conclusion

Honored Educators

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Sanjeev Bhalla, MD - 2014 Honored Educator
Sanjeev Bhalla, MD - 2016 Honored Educator

Chronic Thromboembolic Pulmonary Hypertension (CTEPH): How to Diagnosis it and Why You Should Care: Supported by Bayer Pharma AG

Sunday, Nov. 27 1:30PM - 3:00PM Room: S105D

Participants

PARTICIPANTS

Chairman and Speaker: Narinder Paul, MD, Toronto, Canada Speaker: William Auger, MD, San Diego, USA Alan Maurer, MD, Philadelphia, PA

PROGRAM INFORMATION

This course does not offer CME.

RC101

A Practical Guide to Lung Cancer Screening

Sunday, Nov. 27 2:00PM - 3:30PM Room: E450A

CH CT OI

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

Participants
Caroline Chiles, MD, Winston-Salem, NC, (cchiles@wakehealth.edu) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop the infrastructure for a successful lung cancer screening clinic. 2) Implement the Lung-RADS reporting system. 3) Compare the Lung-RADS reporting system with other currently available nodule risk prediction models. 4) Specify the appropriate management for lung nodules according to nodule size, consistency, and growth patterns. 5) Recognize atypical appearances of screen-detected lung cancers.

ABSTRACT

Lung cancer remains the leading cause of cancer-related death worldwide, but screening with low-dose CT has been shown to reduce lung cancer mortality. This mortality reduction can best be achieved by developing a lung cancer screening clinic that includes shared decision making, smoking cessation programs and CT screens that deliver radiation doses that are ALARA. Nodule management should comply with evidence-driven protocols such as those in the Lung-RADS reporting system developed by the American College of Radiology, with consideration of lung cancer risk for invidual nodules. This course will also highlight nodule risk prediction models that include clinical factors as well as nodule features of diameter/volume, location and consistency to guide nodule management. A pictorial review of NLST-detected lung cancers will emphasize typical appearances, as well as atypical appearances of screen- detected lung cancers.

Sub-Events

RC101A Building a Clinical Program

Participants
Jared D. Christensen, MD, Durham, NC (*Presenter*) Advisory Board, Riverain Technologies, LLC

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC101B LungRads

Participants
James G. Ravenel, MD, Charleston, SC (*Presenter*) Consultant, Imbio, LLC

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC101C Lung Nodule Management

Participants
Jane P. Ko, MD, New York, NY, (jane.ko@nyumc.org) (*Presenter*) Speaker, Siemens AG

LEARNING OBJECTIVES

1) To improve understanding of screening detected nodule management using the lung-RADS reporting system. 2) To understand techniques for further nodule characterization.

ABSTRACT

RC101D Typical and Atypical Manifestations of Screen-Detected Lung Cancer

Participants
Caroline Chiles, MD, Winston-Salem, NC, (cchiles@wakehealth.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Contrast the typical CT appearances of screen-detected lung cancers (small solid, part-solid, and non-solid nodules) with less commonly encountered forms, including cancers that are airspace filling, or associated with cystic air spaces or areas of pulmonary fibrosis. 2) Recognize the typical distribution of screen-detected lung cancers as peripheral lesions within the upper lobes, as compared with those encountered centrally or within the lower lobes.

PS12

Sunday Afternoon Plenary Session

Sunday, Nov. 27 4:00PM - 5:45PM Room: Arie Crown Theater

CH GI MK NR ED PD

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

Participants
Richard L. Baron, MD, Chicago, IL (*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 R&E Foundation exemplifies the 2016 Annual Meeting theme "Beyond the Image" as each and every year, R&E grant recipients pursue projects that go beyond radiologic sciences and touch every area of healthcare delivery and discovery. In the annual address of the R&E Foundation, Board of Trustees Chairman Burton P. Drayer, MD will report on this year's record funding of 101 research and education awards totaling over $4 million, and why the need to support the Foundation is greater than ever. With a 30% funding rate of its applicants, the RSNA R&E Foundation provides a critical source of early support for so many young investigators and educators. It is through their awards that these individuals become engaged in research and excited about the prospect of pursuing a career in academic radiology. R&E grant recipients are poised to lead research efforts in the future that will extend beyond radiology into every area of patient care. To support these efforts and continue forth on this path, the Foundation launched Inspire – Innovate – Invest: The Campaign for Funding Radiology's Future at RSNA 2014. The Campaign is moving steadily toward the Campaign goal of $17.5 million with the support of individuals, private practice groups and our corporate colleagues. For the future of radiologic research to belong to the next generation of radiologists, the specialty must put its financial support squarely behind its Foundation—our Foundation. During the meeting week, please take time to visit the R&E Foundation Booth, located on Level 3 of Lakeside Center to learn more about the 2016 grant recipients, their innovative projects and the many available opportunities to support the Foundation through our Campaign.

PS12B Image Interpretation Session

Participants
Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (*Presenter*) Nothing to Disclose
John Eng, MD, Cockeysville, MD (*Presenter*) Nothing to Disclose
Ellen M. Chung, MD, Bethesda, MD (*Presenter*) Nothing to Disclose
Nancy J. Fischbein, MD, Stanford, CA, (fischbein@stanford.edu) (*Presenter*) Nothing to Disclose
John R. Leyendecker, MD, Dallas, TX, (john.leyendecker@utsouthwestern.edu) (*Presenter*) Nothing to Disclose
Christian W. Pfirrmann, MD, MBA, Forch, Switzerland (*Presenter*) Nothing to Disclose
Gautham P. Reddy, MD, Seattle, WA (*Presenter*) Nothing to Disclose

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Gautham P. Reddy, MD - 2014 Honored Educator

ED003-MO

Chest Monday Case of the Day

Monday, Nov. 28 7:00AM - 11:59PM Room: Case of Day, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants

Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
Paola J. Orausclio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Joaquina Paz Lopez Moras, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Danielle H. Carpenter, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Kimberly G. Kallianos, MD, San Franicsco, CA (*Abstract Co-Author*) Nothing to Disclose
Graham M. Wallace, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Bram Geurts, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC
Agustina Agnetti, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lekshmi Santhosh, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) To analyze interesting chest cases. 2) To understand appropriate differential diagnosis. 3) To understand the clinical significance of the diagnosis presented.

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Santiago E. Rossi, MD - 2015 Honored Educator
Travis S. Henry, MD - 2016 Honored Educator

RC201

Smoking Related Lung Disease: Radiologic-Pathologic Correlation

Monday, Nov. 28 8:30AM - 10:00AM Room: E353C

CH CT

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

Participants
Jeffrey R. Galvin, MD, Baltimore, MD (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the range of lung injury resulting from the inhalation of cigarette smoke. 2) Explain the general mechanisms of cigarette smoke injury. 3) List the currently accepted diagnostic categories. 4) Identify the key imaging features of smoking related lung disease.

ABSTRACT

Symptomatic cigarette smokers are a common source of referral for diagnostic imaging. Radiologists are regularly confronted with an array of findings on plain radiography and computed tomography that mirror varying combinations of emphysema, airway inflammation, airway fibrosis and the changes of pulmonary Langerhans' cell histiocytosis (PLCH). In addition, there is growing acceptance of a link between cigarette smoke and alveolar wall fibrosis. The radiologist is confronted with an extensive list of smoking-related diagnostic categories including: emphysema, obstructive bronchitis, respiratory bronchiolitis-interstitial lung disease (RB-ILD), desquamative interstitial pneumonia (DIP), PLCH and acute eosinophilic pneumonia. These injuries are best understood through correlation of the imaging with pathology and physiology.

Active Handout:Jeffrey R. Galvin

http://abstract.rsna.org/uploads/2016/15001895/SmokingRelatedDLD Fibrosis handout 2016 compressed.pdf

Sub-Events

RC201A Introduction

Participants
Jeffrey R. Galvin, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the range of lung injury resulting from the inhalation of cigarette smoke. 2) Explain the general mechanisms of cigarette smoke injury. 3) List the currently accepted diagnostic categories.

ABSTRACT

Symptomatic cigarette smokers are a common source of referral for diagnostic imaging. Radiologists are regularly confronted with an array of findings on plain radiography and computed tomography that mirror varying combinations of emphysema, airway inflammation, airway fibrosis and the changes of pulmonary Langerhans' cell histiocytosis (PLCH). In addition, there is growing acceptance of a link between cigarette smoke and alveolar wall fibrosis. The radiologist is confronted with an extensive list of smoking-related diagnostic categories including: emphysema, obstructive bronchitis, respiratory bronchiolitis-interstitial lung disease (RB-ILD), desquamative interstitial pneumonia (DIP), PLCH and acute eosinophilic pneumonia. These injuries are best understood through correlation of the imaging with pathology and physiology.

RC201B CT Definable Subtypes of COPD

Participants
Alexander A. Bankier, MD, PhD, Boston, MA (*Presenter*) Author with royalties, Reed Elsevier Consultant, Olympus Corporation

LEARNING OBJECTIVES

1) Describe the current Fleischner classification of chronic obstructive pulmonary disease (COPD). 2) Identify the different categories of emphysema and associated abnormalities on computed tomography. 3) Explain the relationship between image derived assessment of COPD and clinical assessment including pulmonary function.

ABSTRACT

Symptomatic cigarette smokers are a common source of referral for diagnostic imaging. Radiologists are regularly confronted with an array of findings on plain radiography and computed tomography that mirror varying combinations of emphysema, airway inflammation, airway fibrosis and the changes of pulmonary Langerhans' cell histiocytosis (PLCH). In addition, there is growing acceptance of a link between cigarette smoke and alveolar wall fibrosis. The radiologist is confronted with an extensive list of smoking-related diagnostic categories including: emphysema, obstructive bronchitis, respiratory bronchiolitis-interstitial lung disease (RB-ILD), desquamative interstitial pneumonia (DIP), PLCH and acute eosinophilic pneumonia. These injuries are best understood through correlation of the imaging with pathology and physiology.

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Alexander A. Bankier, MD, PhD - 2013 Honored Educator
Alexander A. Bankier, MD, PhD - 2014 Honored Educator
Alexander A. Bankier, MD, PhD - 2015 Honored Educator

RC201C Inflammatory Lung Disease in Smokers

Participants
Seth J. Kligerman, MD, Denver, CO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the categories of cigarette smoke related lung inflammation. 2) Classify the smoking-related inflammatory disorders including: respiratory bronchiolitis, desquamative interstitial pneumonia, pulmonary Langerhans cell histiocytosis and acute eosinophilcpneumonia. 3) Identify the key imaging features of smoking-related inflammatory disease on imaging. 4) Understand how pathologic changes mirror findings on imaging.

ABSTRACT

Smoking Related Lung Disease: Radiologic-Pathologic CorrelationSymptomatic cigarette smokers are a common source of referral for diagnostic imaging. Radiologists are regularly confronted with an array of findings on plain radiography and computed tomography that mirror varying combinations of emphysema, airway inflammation, airway fibrosis and the changes of pulmonary Langerhans' cell histiocytosis (PLCH). In addition, there is growing acceptance of a link between cigarette smoke and alveolar wall fibrosis. The radiologist is confronted with an extensive list of smoking-related diagnostic categories including: emphysema, obstructive bronchitis, respiratory bronchiolitis-interstitial lung disease (RB-ILD), desquamative interstitial pneumonia (DIP), PLCH and acute eosinophilic pneumonia. These injuries are best understood through correlation of the imaging with pathology and physiology.

RC201D Fibrotic Lung Disease in Smokers

Participants
Jeffrey R. Galvin, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the categories of cigarette smoke related lung fibrosis. 2) Identify the key imaging features that indicate the presence of lung fibrosis. 3) Explain the importance of imaging in the interpretation of pulmonary functions.

ABSTRACT

Symptomatic cigarette smokers are a common source of referral for diagnostic imaging. Radiologists are regularly confronted with an array of findings on plain radiography and computed tomography that mirror varying combinations of emphysema, airway inflammation, airway fibrosis and the changes of pulmonary Langerhans' cell histiocytosis (PLCH). In addition, there is growing acceptance of a link between cigarette smoke and alveolar wall fibrosis. The radiologist is confronted with an extensive list of smoking-related diagnostic categories including: emphysema, obstructive bronchitis, respiratory bronchiolitis-interstitial lung disease (RB-ILD), desquamative interstitial pneumonia (DIP), PLCH and acute eosinophilic pneumonia. These injuries are best understood through correlation of the imaging with pathology and physiology.

RC214

Interventional Series: Venous Disease

Monday, Nov. 28 8:30AM - 12:00PM Room: S406B

CH VA IR

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.75

FDA Discussions may include off-label uses.

Participants
Robert J. Lewandowski, MD, Chicago, IL, (r-lewandowski@northwestern.edu) (*Moderator*) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc
Brian S. Funaki, MD, Riverside, IL (*Moderator*) Data Safety Monitoring Board, Novate Medical Ltd
Charles E. Ray JR, MD, PhD, Chicago, IL (*Moderator*) Data Safety Monitoring Board, Novate Medical Ltd; Editor, Thieme Medical Publishers, Inc; Consultant, W. L. Gore & Associates, Inc; Consultant, Medtronic plc; ; ; ; ;

LEARNING OBJECTIVES

1) Describe the use of radio frequency wire in central venous occlusion. 2) List rationale for venous thrombolysis. 3) Describe the indications for balloon retrograde transvenous occlusion (BRTO). 4) Discuss one approach to establishing a PE response team.

ABSTRACT

Sub-Events

RC214-01 PE I: Diagnosis and Triage of Pulmonary Embolism

Monday, Nov. 28 8:30AM - 8:45AM Room: S406B

Participants
Akhilesh K. Sista, MD, New York, NY, (Akhilesh.Sista@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

Learning objectives:1) Be able to distinguish between the Wells criteria and the simplified PESI score.2) Be able to distinguish between massive, submassive, and low-risk PE3) Know the major prospective trials of CDT for pulmonary embolism

LEARNING OBJECTIVES

View learning objectives under main course title.

RC214-02 PE Treatment Options and PERT

Monday, Nov. 28 8:45AM - 9:00AM Room: S406B

Participants
Sanjay Misra, MD, Rochester, MN, (Misra.sanjay@mayo.edu) (*Presenter*) Data Safety Monitoring Board, Flexible Stenting Solutions, Inc

LEARNING OBJECTIVES

1. Discuss different endovascular treatment options for PE.2. Become familiar with the technology used for treating PE.3. Identify components of a PE Response Team (PERT)

ABSTRACT

LEARNING OBJECTIVES

View learning objectives under main course title.

RC214-04 The Selection of Blood Suppression Inversion Time in Unenhanced MR Pulmonary Angiography in Diagnosis of Pulmonary Embolism

Monday, Nov. 28 9:10AM - 9:20AM Room: S406B

Participants
Sishu Yuan, Wuhan, China (*Presenter*) Nothing to Disclose
Zi Wang, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study the detection accuracies in diagnosis of pulmonary embolism (PE) with different blood suppression inversion time (BSP-TI) in unenhanced MR angiography by applying spatial labeling with multiple inversion pulses sequence (SLEEK) imaging, and evaluate the image quality.

METHOD AND MATERIALS

61 patients (38 males and 23 females) diagnosed with pulmonary embolism (PE) using computed tomographic pulmonary angiography (CTPA) underwent SLEEK MR angiography within 48 hours. Taking the results of as CTPA a reference, accuracy for PE detection were calculated and compared SLEEK MRA sequences with different BSP-TIs, the images quality were also evaluated.

RESULTS

When BSP-TI=900ms, the best image quality was obtained. Diagnose accuracy for PE of different BSP-TIs (BSP-TI=500ms, 700ms, 900ms, 1100ms, 1300ms, 1500ms) were 62.3%, 89.3%, 90.4%, 84.6%, 77.0%, 69.3%, respectively. However, if there was atelectasis or pulmonary infection, BSP-TI=1300ms and 1500ms may help to better depict the pulmonary artery and PE.

CONCLUSION

For most of patients, the best image quality and the hightest diagnose accuracy of PE was obtained when BSP-TI=900ms. However, if there was atelectasis or pulmonary infection, evaluating BSP-TI could help to show the pulmonary artery and embolus in that area.

CLINICAL RELEVANCE/APPLICATION

For most of patients, the best image quality and the hightest diagnose accuracy of PE was obtained when BSP-TI=900ms. However, if there was atelectasis or pulmonary infection, evaluating BSP-TI could help to show the pulmonary artery and embolus in that area.

RC214-05 Risk of Venous Thromboembolism Following a Single Negative Proximal Compression Ultrasound

Monday, Nov. 28 9:20AM - 9:30AM Room: S406B

Awards
Student Travel Stipend Award

Participants
Myles M. Mitsunaga, MD, Honolulu, HI (*Presenter*) Nothing to Disclose
Shannon Kogachi, MS, Honolulu, HI (*Abstract Co-Author*) Nothing to Disclose
Hyo-Chun Yoon, MD, PhD, Honolulu, HI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

There is ongoing discussion regarding the optimal ultrasound scanning protocol for diagnosing deep vein thrombosis (DVT): imaging of the proximal veins with one additional proximal venous scan 1 week after the initial scan, versus a one-time whole-leg compression ultrasound, evaluating both proximal and distal infrapopliteal veins. At our institution, we have performed only a single, one-time proximal compression ultrasound limited to the femoral and popliteal veins (single proximal CUS) without a serial examination. Purpose: To determine the 3-month rate of venous thromboembolism (VTE) and clinical outcomes of symptomatic inpatients and ambulatory patients with normal findings on single proximal CUS.

METHOD AND MATERIALS

Single proximal CUS results and clinical data of all inpatient and ambulatory patients with suspected acute (DVT) were retrospectively reviewed during a 12-month period between January and December 2014. 3 month follow-up data were reviewed for all these patients who received all their care from a single geographically isolated health maintenance organization.

RESULTS

1295 patients with suspected deep vein thrombosis underwent single proximal CUS during the 12-month period. 111 of 1295 (8.6%) patients were positive for acute DVT at the initial proximal CUS. Of the remaining 1184 patients with initially negative proximal CUS sampled at 3-months follow-up, 1075 (90.8%) had no VTE event, 11 (0.9%) suffered from a subsequent VTE event (confirmed by a subsequent positive CUS or pulmonary embolism study), 53 (4.5%) died from causes unrelated to VTE, and 45 (3.8%) were lost to follow-up.

CONCLUSION

Overall, our 3-month cumulative rate of VTE following a single negative proximal CUS was 11 of 1184 or 0.9% (95%, confidence interval 0.4-1.5). Our confidence interval overlaps with those of serial proximal CUS protocols.

CLINICAL RELEVANCE/APPLICATION

Single proximal CUS is sufficient to exclude acute DVT in the vast majority of patients, rendering serial proximal CUS unnecessary for most patients.

RC214-06 Chronic Venous Recanalization

Monday, Nov. 28 9:30AM - 9:45AM Room: S406B

Participants
Marcelo S. Guimaraes, MD, Charleston, SC, (guimarae@musc.edu) (*Presenter*) Consultant, Cook Group Incorporated ; Consultant, Baylis Medical Company; Consultant, Terumo Corporation; Patent holder, Cook Group Incorporated

LEARNING OBJECTIVES

1) Patient selection and work-up. 2) Strategy and devices to recanalize complex central venous occlusions. 3) How to avoid and how to be prepared for complications. 4) RF wire technique details.

ABSTRACT

Recanalization of chroninc venous occlusionsMarcelo Guimaraes, MD, FSIRChronic and complex central venous occlusions (brachiocephalic, SVC and IVC) are typically associated with symptoms and the recanalization may be challenging. The recanlization with RF wire technique will be presented and patient selection, work-up, technical details, how to avoid and manage complications and results will be discussed.

RC214-07 Debate: Submassive PE: Should Catheter-directed Therapy be Used?

Monday, Nov. 28 9:45AM - 10:00AM Room: S406B

Participants

Steven M. Zangan, MD, Chicago, IL (*Presenter*) Nothing to Disclose
John A. Kaufman, MD, Portland, OR (*Presenter*) Advisory Board, Bio2 Technologies, Inc; Consultant, Cook Group Incorporated; Consultant, Guerbet SA; Stockholder, Hatch Medical LLC; Stockholder, VuMedi, Inc; Stockholder, Veniti, Inc; Royalties, Reed Elsevier; Advisory Board, Delcath Systems, Inc; Researcher, W. L. Gore & Associates, Inc; Researcher, EKOS Corporation; Stockholder, EndoShape, Inc; Advisory Board, AV Medical Technologies Ltd; Advisory Board, Javelin Medical

LEARNING OBJECTIVES

1) To define submassive pulmonary embolism. 2) To examine current treatment algorithms for pulmonary embolism. 3) To assess current literature regarding catheter directed therapy for submassive pulmonary embolism. 4) To identify complications of catheter directed thrombolysis.

RC214-08 May-Thurner and Paget-Schroetter - Commonalities and Differences

Monday, Nov. 28 10:15AM - 10:30AM Room: S406B

Participants
Charles E. Ray JR, MD, PhD, Chicago, IL (*Presenter*) Data Safety Monitoring Board, Novate Medical Ltd; Editor, Thieme Medical Publishers, Inc; Consultant, W. L. Gore & Associates, Inc; Consultant, Medtronic plc; ; ; ; ;

RC214-09 IVC Filters: New Evidence and Ongoing Trials

Monday, Nov. 28 10:30AM - 10:45AM Room: S406B

Participants
Matthew S. Johnson, MD, Indianapolis, IN, (matjohns@iupui.edu) (*Presenter*) Research Consultant, Boston Scientific Corporation; Research Consultant, Cook Group Incorporated; Research Consultant, CeloNova BioSciences, Inc; Research Consultant, BTG International Ltd; Research support, BTG International Ltd; ;

LEARNING OBJECTIVES

ABSTRACT

RC214-10 Retrospective Analysis of Dwell Times and the Use of Advanced Retrieval Techniques (ART) in Patients Undergoing Inferior Vena Cava Filter (IVCF) Retrieval Procedures: A Single-center Experience

Monday, Nov. 28 10:45AM - 10:55AM Room: S406B

Participants
Laura p. Pletsch Borba, Porto Alegre, Brazil (*Presenter*) Nothing to Disclose
Vanessa F. Furtado, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Melissa Chittle, MS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
George R. Oliveira, MD, East Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Thomas G. Walker, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Zubin Irani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Gloria M. Salazar, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the impact of increased dwell times in the use of ATR and procedural complications in patients undergoing IVCF removal.

METHOD AND MATERIALS

In this IRB-HIPPA compliant study, a retrospective review of medical records was performed of patients undergoing IVCF retrieval between January 2011 and April 2016, at the Division of Interventional Radiology. The following data was collected: demographics, indications for IVCF, use of intravascular ultrasound (IVUS) on placement, dwell times (days), procedural complications, and imaging studies (CT abdomen). All complications were classified according to societal guidelines. All results are given in percentages, mean, ±SD, and range. Statistical analysis was performed with Fisher's exact and Mann-Whitney tests.

RESULTS

148 patients were identified: 81 male(age:53.83±15.45) and 67 female(age:55.06±17.26); who had the following indications for IVCF: 45.6% absolute, 14.3% relative and 40.1% prophylactic. A total of 143 patients underwent successful IVCF retrieval procedure at the first attempt (96.6%). A second attempt was performed in 5 patients with an 80% (n=4) success rate and one patient underwent filter retrieval at the third attempt. ART was performed in 8.1% (n=12) patients, in the first procedure, which included use of endobronchial forceps or the use of endovascular maneuvers. The overall complication rate was 6.8% (n=10), including: leg embedded into caval wall (n=7), emboli trapped in the filter (n=2), filter tilt (n=6), filter unable to retrieve (n=5) and need for controlled filter fracture during the procedure (n=1). Mean filter dwell time was 145.30(3–716) days. Increased dwell times (>100 days) was significantly associated with the use of ART ($p<.05$). Retrieval complications were significantly associated with ART ($p<.05$). Use of IVUS was not associated to retrieval complications or ATR.

CONCLUSION

IVCF can be successfully retrieved at the first procedure, with a 96.6% success rate, with the addition of ART. Increased dwell time was significantly associated with the use of ART. Consideration of ART should be done earlier in filters with dwell times higher than 100 days.

CLINICAL RELEVANCE/APPLICATION

IVCF retrieval rates remain low nationally with implications for patient outcomes. We sought to evaluate the impact of prolonged indwelling time in the use of ATR in filter retrieval procedures.

RC214-11 Keen Endovascular sNare Strategy (KENS) - Fluoroscopic Procedure Time as a Prognosticator of IVC Filter Retrieval Success

Monday, Nov. 28 10:55AM - 11:05AM Room: S406B

Awards
Student Travel Stipend Award

Participants
Jin Qian, MD, Burlington, VT (*Presenter*) Nothing to Disclose
James B. Allison, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Richard Watts, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Christopher S. Morris, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Anant D. Bhave, MD, Richmond, VT (*Abstract Co-Author*) Nothing to Disclose
Joseph T. Shields, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if there is a reliable time point during an IVC filter retrieval attempt after which the success rate for removal becomes unlikely without using advanced techniques, which are defined as any technique other than loop snare removal.

METHOD AND MATERIALS

IRB approval was obtained for the retrospective analysis of IVC filter retrieval procedures performed between 2011 and 2015 by the authors' institutional IR division. The fluoroscopic time, retrieval technique, type of filter, and operator experience were analyzed. Mann-Whitney rank-sum tests were used to compare the difference between the group using standard technique and those requiring advanced technique. Cumulative success rates of the two were plotted against the fluoroscopic time. A time point after which continued attempts with standard retrieval method would result in diminishing returns was determined.

RESULTS

The overall filter retrieval success rate was 93.0%. Standard technique was successful in 99.2% of cases, while advanced techniques were only successful in 57.1% of attempts. Procedures using advanced techniques were associated with longer fluoroscopic time than the standard technique (mean time 1665 sec; 95% CI: 1252, 2078 vs. 330 sec; 95% CI: 278, 383, X2 = 384, p-value<0.0005). Transition points were determined at 612 seconds (94.2% success) for standard technique and 1386 seconds (48.0% success) for advanced technique when the success rates taper off. A ROC curve revealed that at 654 seconds (sensitivity=0.952, specificity=0.950), most operators in our department had completed the procedure using the standard technique or had switched to an advanced technique.

CONCLUSION

IVC filter retrievals are less likely to be successful if standard retrieval techniques require more than 10 minutes of fluoroscopic time. If the fluoroscopic time is greater than 23 minutes, advanced techniques are also unlikely to succeed and the operator should consider aborting the procedure to avoid further radiation to the patient.

CLINICAL RELEVANCE/APPLICATION

Operators with different level of experience performing IVC filter retrieval can refer to our data in determining optimal times to change technique or terminate the procedure when a particular method is not successful. This may apply to academics or private practice settings. It will limit the patient and operator radiation doses in instances where the benefit of continued attempts will likely be limited.

RC214-12 Electric Field Ablation of Venous Thrombosis Prevents Clot Organization and Increases Vein Patency: Novel Deep Vein Thrombosis Intervention

Monday, Nov. 28 11:05AM - 11:15AM Room: S406B

Participants
Rahmi Oklu, MD, PhD, Scottsdale, AZ (*Presenter*) Nothing to Disclose
Hassan Albadawi, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to examine whether targeted low voltage electric fields could cause non-thermal decellularization of venous thrombus and promote natural resolution.

METHOD AND MATERIALS

Electric field (EF) parameters were optimized using neutrophils, HUVECS and blood clots formed within microfluidic chambers fabricated by replica molding of PDMS and standard photolithography techniques. Rheological analysis and temperature measurements were made using Anton Paar MCR 301 rheometer and IT-21, Ø=0.4 mm, PhysiTemp system, respectively; in vitro and in vivo currents were measured using PicoScope 4224 Oscilloscope. Once non-thermal EF conditions were optimized in vitro, in vivo experiments on venous thrombosis using a rat bilateral femoral vein ligation model was performed. Following groin exposure, all visible side branches including the inferior epigastric and the muscular branch were ligated except for the profunda femoris vein. One side was subjected to EF while the other side did not receive treatment serving as the control. After 3 or 7 days, the ligated veins were processed for histology, immunohistochemistry (NETs, collagen, MPO, tissue factor), Western blotting (tissue factor) and cytokine analysis from tissue lysates (27 growth factors). Patency, nucleated cell counts, vein circumference and immunostaining were measured using ImageJ.

RESULTS

Live/dead cell assays using microfluidic chambers and ex-vivo 6 mm PDMS realistic vessel like structures revealed non-thermal, optimal cell death (>90%) at 60-120 V/mm. Using Instron testing system, the ability to clot fresh blood was not affected at EF up to 460V/mm. At day 3 and at day 7, EF treated venous thrombi compared to sham control groups demonstrated wide patency ($P<0.0001$); reduced collagen levels ($P=0.003$); decreased nucleated cells ($P<0.0001$); decreased neutrophils, macrophages and NETs ($P< 0.0001$); decreased tissue factor, IL-4, TGF-β1, TGF-β2, and TGF-β3 ($P<0.05$) and the average circumference of the veins was similar ($P=0.18$) suggesting that the treatment did not cause venous aneurysms.

CONCLUSION

Non-thermal EF ablation of nucleated cells within DVT significantly impacts the organization capability of the thrombus, promoting natural clearance.

CLINICAL RELEVANCE/APPLICATION

EF ablation for treatment of DVT may potentially decrease the incidence of post-thrombotic syndrome associated with conventional anticoagulant therapies.

RC214-13 DVT Iysis: An Update

Monday, Nov. 28 11:15AM - 11:30AM Room: S406B

Participants
Kush R. Desai, MD, Chicago, IL, (kdesai007@northwestern.edu) (*Presenter*) Speakers Bureau, Cook Group Incorporated; Consultant, Cook Group Incorporated

LEARNING OBJECTIVES

Venous thrombolysis is a rapidly evolving space. Several devices/approaches have been recently introduced, improving procedural ease and patient outcomes. Prospective data on the benefits of thrombolysis in the prevention of post-thrombotic syndrome is forthcoming as well. In this session, we will review the history, rationale, and data behind deep venous thrombolysis, followed by a discussion of current practice, emerging technologies, and future directions.

ABSTRACT

LEARNING OBJECTIVES

1) Venous thrombolysis is a rapidly evolving space. Several devices/approaches have been recently introduced, improving procedural ease and patient outcomes. Prospective data on the benefits of thrombolysis in the prevention of post-thrombotic syndrome is forthcoming as well. In this session, we will review the history, rationale, and data behind deep venous thrombolysis, followed by a discussion of current practice, emerging technologies, and future directions.

ABSTRACT

N/A

RC214-14 IVC Filters: Past, Present, and Future

Monday, Nov. 28 11:30AM - 11:45AM Room: S406B

Participants
John A. Kaufman, MD, Portland, OR (*Presenter*) Advisory Board, Bio2 Technologies, Inc; Consultant, Cook Group Incorporated; Consultant, Guerbet SA; Stockholder, Hatch Medical LLC; Stockholder, VuMedi, Inc; Stockholder, Veniti, Inc; Royalties, Reed Elsevier; Advisory Board, Delcath Systems, Inc; Researcher, W. L. Gore & Associates, Inc; Researcher, EKOS Corporation; Stockholder, EndoShape, Inc; Advisory Board, AV Medical Technologies Ltd; Advisory Board, Javelin Medical

RC214-15 Debate: Retrievable Filters: Get Them All Out!

Monday, Nov. 28 11:45AM - 12:00PM Room: S406B

Participants
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Robert J. Lewandowski, MD, Chicago, IL, (r-lewandowski@northwestern.edu) (*Presenter*) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc

LEARNING OBJECTIVES

LEARNING OBJECTIVES

1) Understand the importance of removing IVC filters that are no longer required. 2) Name the risks of potentially retrievable IVC filters. 3) Cite literature demonstrating safety and efficacy of removing IVC filters with advanced techniques.

RC254

Precision Medicine through Image Phenotyping

Monday, Nov. 28 8:30AM - 10:00AM Room: S404AB

CA CH VA BQ IN

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

Participants

Ella A. Kazerooni, MD, Ann Arbor, MI, (ellakaz@umich.edu) (*Moderator*) Nothing to Disclose
Ella A. Kazerooni, MD, Ann Arbor, MI, (ellakaz@umich.edu) (*Presenter*) Nothing to Disclose
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John J. Carr, MD, MS, Nashville, TN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn what the term precision medicine means. 2) To understand how informatics intersects with clinical radiology to enable precision medicine in practice. 3) To learn through concrete examples how informatics based radiology precision medicine impacts health

ABSTRACT

Biomarkers have been emrabced by both the scientific and regulatory communities as surrogates end points for clinical trials, paving the way for their widespread use in medicine. The field of imaging biomarkers has exploded, and the their integration into clinical practice relies heaving on and intersects with the field ofbioinformatics.. Once specific biomakers are show to have value, easily integrating them into the digital environment of the radiologist and communcating them to the health care providers and or directly to patients effeiciently and seamlessly is important for their value and impact on health to be realized. Culturally, it is taking radiologists from the era of description and largely qualitative reporting, into a quantitative future state, and leveraging informatics to extract information from imaging alone ot together with data available in the electronic medical record is essential for future sucess in this new world. To get there, understanding the impact of this approach as a value of our services, and standardization of imaging technques along the lines of what the RSNA QIBA initiative is designing, are essential, so that imaging biomarkers are robust, accurate and reprodicbile. Embraching this approach enables and facilitates new appracohes, relationships of imaging and IT researchers, vendors and consumers, to fully realize the possiblities. This course willdiscuss and describe the overall constructs, and use tangible exams of using this in practice today and for the future.

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/

Ella A. Kazerooni, MD - 2014 Honored Educator

SSC03

Science Session with Keynote: Chest (Nodule/Radiomics)

Monday, Nov. 28 10:30AM - 12:00PM Room: S404CD

CH CT MR

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

Participants
Jo-Anne O. Shepard, MD, Boston, MA (*Moderator*) Nothing to Disclose
Christian J. Herold, MD, Vienna, Austria (*Moderator*) Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Agfa-Gevaert Group; Research Grant, Bracco Group; Research Grant, Guerbet SA; Speakers Bureau, Bayer AG; Speakers Bureau, Bracco Group; Stockholder, Hologic, Inc

Sub-Events

SSC03-01 Chest Keynote Speaker: Fleischner Society Nodule Guidelines Update

Monday, Nov. 28 10:30AM - 10:40AM Room: S404CD

Participants
Heber MacMahon, MD, Chicago, IL (*Presenter*) Consultant, Riverain Technologies, LLC; Stockholder, Hologic, Inc; Royalties, UCTech; Research support, Koninklijke Philips NV; Consultant, General Electric Company

SSC03-02 Diameter Measurement of the Solid Component in Sub-solid Nodules on CT: Effect of Window Setting and Reconstruction Image Plane on Prediction of Invasive Component of Lung Adenocarcinoma

Monday, Nov. 28 10:40AM - 10:50AM Room: S404CD

Awards
Student Travel Stipend Award

Participants
Hyungwoo Ahn, MD, Seongnam-si, Korea, Republic Of (*Presenter*) Nothing to Disclose
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Jihang Kim, MD, Seongnam, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We aimed to assess the effect of window setting and reconstruction image plane in measuring the solid component within subsolid nodules (SSNs) and its predictive value on the size of invasive component.

METHOD AND MATERIALS

We searched the lung adenocarcinoma operation records at our institution from Feb 2012 to Oct 2015 and identified 252 nodules in 225 patients which manifested as SSNs on thin-section preoperative chest CT. For each nodule, all serial CT slices containing the nodule were reconstructed in axial, coronal and sagittal planes. Two radiologists independently measured the solid component with lung and mediastinal window settings in three reconstruction planes. On the representative CT image, long diameter was measured with lung window and both long and short diameters were measured in mediastinal window. The correlation between the CT and pathologic measurements and interobserver variability were assessed using intra-class correlation (ICC).

RESULTS

The size of invasive component showed good correlation with the long diameter of the solid component in lung window (ICC range, 0.71–0.76) and also with the average of long and short diameters in mediastinal window (ICC range, 0.63–0.68). The size of solid component on CT tended to be smaller than that of invasive component on all measurements. With regard to window setting, the difference between the size of solid component and invasive component was smaller in lung window (mean difference, 0.43–1.22 mm) than in mediastinal window (mean difference, 4.04–5.01 mm) on all image planes. In addition, the difference between the size of solid component and invasive component was smallest when the maximum diameter on three reconstruction plane was measured (mean difference, 0.43 mm [95% CI: -1.05, 0.18] with lung window). Interobserver agreement in CT measurements was excellent (ICC range, 0.85–0.92) either with lung or mediastinal window setting.

CONCLUSION

Measuring the solid component in lung window on the three (axial, coronal, and sagittal) reconstruction planes better predicts the size of invasive component than the method by the 2013 Fleischner Society's guideline.

CLINICAL RELEVANCE/APPLICATION

Measuring the solid component in lung window on the three reconstruction planes may help in determination of the extent of surgical resection by better predicting pre-invasive and minimally invasive adenocarcinomas.

SSC03-03 Solitary Pulmonary Nodule: Comparison of the Capability for Differentiating Malignant from Benign Nodules among Quantitatively Assessed Dynamic First-Pass CE-Perfusion ADCT and MR Indexes and FDG-PET/CT

Monday, Nov. 28 10:50AM - 11:00AM Room: S404CD

Participants
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co,

Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
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PURPOSE

To compare the capability for differentiating malignant from benign nodules among quantitatively assessed dynamic first-pass contrast-enhanced (CE-) perfusion area-detector CT (ADCT) and magnetic resonance imaging (MRI) indexes and FDG-PET/CT.

METHOD AND MATERIALS

57 consecutive patients (38 male, 29 female; mean age 73 years) with 71 nodules underwent dynamic CE-perfusion ADCT and MRI, PET/CT, and microbacterial and/or pathological examinations. 71 nodules were classified into two groups based on the final diagnoses: malignant (n=45) and benign nodules (n=26). All dynamic CE-perfusion CT examinations were performed on a 320-detector row CT, and dynamic CE-perfusion MRI at a 3T system. All PET/CT examinations were performed by using standard technique on a PET/CT scanner. In each patient, total nodule perfusion (TNP) and nodule perfusions from pulmonary (NPP) and systemic (NPS) circulations calculated by dual-input maximum slope method from on dynamic ADCT and MRI data and SUVmax on PET/CT were assessed by ROI measurements. Then, all indexes were compared between malignant and benign nodules by Student's t-test. On each index, ROC analysis was performed, and feasible threshold value was determined. Finally, sensitivity, specificity and accuracy were compared each other by using McNemar's test.

RESULTS

All indexes had significant difference between malignant and benign nodules ($p<0.001$). Area under the curves (Azs) of TNPs of dynamic ADCT (Az=0.89) and MRI (Az=0.88) were significantly larger than that of NPSs on both methods (ADCT: Az=0.75, $p<0.05$; MRI: Az=0.81, $p<0.05$). When feasible threshold values adopted, accuracy of TNP on dynamic ADCT (87.3 [62/71] %) and MRI (87.3 [62/71] %) was significantly higher than that of NPSs (ADCT: 77.5 [55/71] %, $p=0.008$; MRI: 77.5 [55/71] %, $p=0.008$) and SUVmax (78.9 [56/71] %, $p=0.02$).

CONCLUSION

Quantitatively assessed dynamic first-pass CE-perfusion ADCT and MRI indexes have better potential than PET/CT for differentiaing malignant from benign nodules. In addition, both quantitative perfusion methods are considered as having same potential in this setting.

CLINICAL RELEVANCE/APPLICATION

Quantitatively assessed dynamic first-pass CE-perfusion ADCT and MRI indexes have better potential than PET/CT for differentiaing malignant from benign nodules. In addition, both quantitative perfusion methods are considered as having same potential in this setting.

SSC03-04 Ultra-short TE Imaging at 3T for the Morphological Characterization of Pulmonary Nodules

Monday, Nov. 28 11:00AM - 11:10AM Room: S404CD

Participants
Mark O. Wielpuetz, Heidelberg, Germany (*Abstract Co-Author*) Speakers Bureau, Berlin-Chemie AG; Research Consultant, Boehringer Ingelheim
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Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
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Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

Ultra-short echo time (UTE) magnetic resonance imaging (MRI) has been shown to deliver high-resolution images comparable to computed tomography (CT). Here we evaluate UTE's potential for precise lung nodule characterization at 3T.

METHOD AND MATERIALS

Fifty-one patients (mean age 68.7±10.8years) with 119 nodules/masses of 4-88mm (mean 17.4±16.3mm) underwent CT (1mm slice

thickness) and UTE (1mm3 isotropic resolution). Two chest radiologists assessed long axis, contrast-to-noise ratio (CNR), and detailed morphology (attenuation, margin, internal lucency) in consensus for CT, and for UTE in a blinded fashion. Sensitivity, specificity and inter-method agreement for morphological features were calculated with CT being the standard of reference.

RESULTS

Nine nodules (7.5%) were not visible on UTE, mostly due to very low CT attenuation. UTE tended to underestimate the long axis by 1.2±3.4mm compared to CT (p=0.359), with higher differences observed in part-solid (-2.6±5.1mm, p<0.05) and purely ground-glass (GGO) (-1.4±2.8 mm, n.s.) than in solid nodules (-0.7±2.6 mm). Mean CNR was 20.0±12.1 for CT and 36.1±21.5 for UTE (p<0.001). As in CT, CNR of part-solid (37.4±19.4) and GGO (13.9±8.6) was lower than of solid nodules (39.0±21.8) with UTE (p<0.05-0.001). Sensitivity and specificity of UTE for identifying part-solid attenuation were 57.7% and 97.6%, but were 90.9% and 98.0% for purely GGO attenuation (κ=0.71). Sensitivity and specificity for margin characteristics were: 70.6% and 93.2% for lobulation, 61.5% and 95.2% for spiculation, 87.0% and 93.8% for pleural tags, respectively (κ=0.64-0.81). Internal lucencies were correctly identified in 72.7% with 96.1% specificity (κ=0.73). Calcification was always not identified with UTE.

CONCLUSION

UTE showed high diagnostic properties for nodule size and morphology assessment, otherwise unprecedented by MRI. It should be developed further into a routine modality for nodule detection and lung cancer staging as part of comprehensive whole-body protocols.

CLINICAL RELEVANCE/APPLICATION

UTE of the chest may prove useful as a novel modality for lung cancer screening and staging, and pediatric oncology, reducing radiation burden in these populations due to repeat surveillance imaging.

SSC03-05 Quantitative CT Analysis of Pulmonary Pure Ground-Glass Nodule Predicts Histological Invasiveness

Monday, Nov. 28 11:10AM - 11:20AM Room: S404CD

Participants
Fan Li, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Qiong Li, Shanghai, China (*Presenter*) Nothing to Disclose
Shi Yuan Liu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether quantitative CT analysis enables predict histological invasiveness of pulmonary adenocarcinoma, appearing pure ground glass nodules (pGGNs).

METHOD AND MATERIALS

We retrospectively evaluated 110 pulmonary pure GGNs resected between June 2012 and October 2015, and pathologically classified them as pre-invasive lesions[included atypical adenomatous hyperplasia (AAH)and adenocarcinoma in situ (AIS);n =50],MIA (n=28), or invasive adenocarcinoma (n=32). Nodule size , the largest cross-sectional area , volume, mean CT value , mass, and CT attenuation values at the 0th,2th,5th, 25th, 50th,75th, 95th,98th and 100th percentile on histogram, and the slopes of CT attenuation values from 5th to 95th percentlie, 25th to 75th percentlie, 2th to 98th percentle ,0th to 100th percentle of the three groups were compared.A multivariate logistic regression analysis and Receiver operating curve (ROC) were performed to evaluate the differentiating performance in predicting histological invasiveness.

RESULTS

Of 110 pure GGNs, 22 were AAH, 28 were AIS, 28 were MIA, and 32 were invasive adenocarcinoma. The nodule size, the largest cross-sectional area , mass were significantly larger in the invasive adenocarcinoma group than in the pre-invasive and MIA groups.The 95th ,98th ,100th percentile, slope (2th to 98th),slope(25th to 75th),slope (0th to 100th) were significantly different from pre-invasive lesions and MIA or invasive adenocarcinoma. Logistic regression analysis showed that the nodule size (OR 1.21, 95% CI: 1.071 ~ 1.366, p <0.01) , the 100th percentile on CT number histogram (OR: 1.02, 95% CI: 1.009 ~ 1.032, p <0.001) and the slope (0th to 100th) (OR: 0.248, 95% CI:0.094 ~ 0.653, p <0.01) predicted the histological invasiveness independently. ROC curve analysis was performed based on the predicted probability of Logistic regression model, and the area under the curve was 0.824 (95% CI:0.745~0.903, p <0.001) .

CONCLUSION

Quantitative analysis of CT imaging can predict histological invasiveness of pGGNs, especially maximum diameter and 100th percentile on CT number histogram, which can instruct the long-term follow-up and selective surgical management.

CLINICAL RELEVANCE/APPLICATION

CT number histogram measurements of pure GGNs can reflect the heterogeneity of tumor and be useful for monitoring pure GGNs growth.

SSC03-06 CT Texture Analysis of Lung Cancer Nodule's Microenvironment: Initial Experience

Monday, Nov. 28 11:20AM - 11:30AM Room: S404CD

Participants
Monica Enescu, DPhil,MSc, Oxford, United Kingdom (*Presenter*) Employee, Mirada Medical Ltd
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P Whybra, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd
Chuan Liang, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
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Timor Kadir, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Mirada Medical Ltd.
Reginald F. Munden, MD, DMD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT Texture analysis (CTTA) of lung cancer nodules has been identified as a potential imaging biomarker of malignancy. The purpose of this study was to determine if the microenvironment around such nodules is different from normal lung parenchyma and also a potential biomarker.

METHOD AND MATERIALS

A retrospective analysis of CT images from 53 lung cancer patients was performed. One lesion was delineated for each patient. CTTA was performed on the parenchyma surrounding a lesion and contralateral normal parenchyma. The regions of interest (ROIs) were: ROI1 was a 7mm region of parenchyma around the malignant nodule; ROI2, the reference containing normal parenchyma, was selected by mirroring ROI1 in the other lung. ROI3 and ROI4 were control regions measured at different levels in the lung containing the lesion and the contralateral lung to ensure that the observed difference did not represent differences between the lung's textures. 20 texture features including Haralick, Laws features and summary statistics were extracted for the 4 regions. A Support Vector Regressor model (libSVM) was trained on an independent population of pulmonary nodules and used to predict a malignancy score for each region of the current dataset. The Wilcoxon rank-sum test was used to compare the malignancy scores obtained for ROI1 vs. ROI2, and ROI3 vs. ROI4.

RESULTS

The mean scores for ROI1-4 were 0.236 (sd 0.210), 0.020 (sd 0.232), 0.056 (sd 0.289) and 0.063 (sd 0.252), respectively. There was a statistically significant difference between the malignancy scores for ROI1 and ROI2 (p-value = 3.41e-06). By comparison, we found no difference between control regions ROI3 and ROI4 (p-value = 0.77).

CONCLUSION

CTTA is able to identify texture changes in the microenvironment around a nodule. These parenchymal changes may be a biomarker of malignancy.

CLINICAL RELEVANCE/APPLICATION

Identifying early changes in the lung parenchyma may allow early diagnosis of malignant pulmonary lesions.

SSC03-07 Radiomic Features of the Perinodular Habitat on Non-contrast Lung CT Discriminates Adenocarcinoma from Granulomas

Monday, Nov. 28 11:30AM - 11:40AM Room: S404CD

Participants
Niha G. Beig, MS,BEng, Cleveland, OH (*Presenter*) Nothing to Disclose
Mahdi Orooji, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Prabhakar Rajiah, MD, FRCR, Dallas, TX (*Abstract Co-Author*) Institutional Research Grant, Koninklijke Philips NV; Speaker, Koninklijke Philips NV
Sagar Rakshit, MBBS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
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Frank Jacono, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Prateek Prasanna, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Pallavi Tiwari, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
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Robert C. Gilkeson, MD, Cleveland, OH (*Abstract Co-Author*) Research Consultant, Riverain Technologies, LLC; Research support, Koninklijke Philips NV; Research support, Siemens AG ; Research support, General Electric Company
Philip A. Linden, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Anant Madabhushi, PhD, Piscataway, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

From a radiographic perspective, it is difficult to distinguish lung adenocarcinoma (AC) from granuloma (Gr). While these nodules can have similar appearances and both can show increased activity on PET CT evaluation, the vascular invasion and lymphangiogenesis in the perinodular habitat of AC is different from Gr. We seek to see if this biological difference can be captured by gradient based radiomic descriptors on non-contrast CT images. The challenges of a multi-site cohort are also addressed by separating the scans, based on CT reconstruction kernels (rK).

METHOD AND MATERIALS

Histology confirmed 69 non-contrast lung CT scans with 45 AC & 24 Gr cases were acquired from multiple Siemens CT scanners with different rK.Each patient had 2 rK CT scans. rK of B30f/s, B31f, B35f/s, B41f/s were grouped as 'smooth rK' & scans with a rK of B50f/s, B60f/s, B70f, B80f were grouped as 'sharp rK'. Regions of interest(ROI) were annotated by an expert reader. In the perinodular habitat, all 'air' pixels lesser than -900 Hounsfield units were removed before radiomic analysis. For each lesion, first order statistics were then derived from different radiomic descriptor families (example Haralick, Laws Energy, Histogram of oriented Gradient (HoG) and Gabor) resulting in a total 732 computerized 2D texture features.100 iterations of 3 fold cross validation were setup to evaluate the performance of features using Area Under the receiver-operating characteristic Curve (AUC) via Quadratic Discriminant Analysis (QDA) classifier.Most discriminative features were identified by using Feed Forward Feature Selection (FFFS) method.

RESULTS

From the smooth rK scans, top four features consisting of Gabor & Histogram of oriented Gradient (HoG), provided an AUC of 0.84±0.05 for distinguishing AC from Gr on CT.Smooth rK scans performed better than sharp rK (AUC=0.72±0.08), emphasizing that different CT acquisition pararmeters effect radiomic analysis.

CONCLUSION

The perinodular habitat has textural attributes that can differentiate AC from Gr. Radiomic descriptors such as Gabor and HoG may be capturing the higher lymphatic vessel density around AC. Independent validation on a larger cohort is required to authenticate the results.

CLINICAL RELEVANCE/APPLICATION

~ 30% of suspicious nodules undergoing biopsy for histologic confirmation are benign.Radiomic analysis of perinodular habitat can help reduce the number of unnecessary wedge resections for granulomas.

Honored Educators

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Prabhakar Rajiah, MD, FRCR - 2014 Honored Educator

SSC03-08 Evaluating Characteristics of Intrapulmonary Lymph Nodes Could Change Management of Pulmonary Nodules

Monday, Nov. 28 11:40AM - 11:50AM Room: S404CD

Participants
Matthew J. Stephens, MD, Denver, CO (*Presenter*) Nothing to Disclose
Byung-Hak Rho, MD, Namgu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Douglas C. Everett, PhD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc

PURPOSE

The purpose of this study was to evaluate pulmonary nodules in terms of intrapulmonary lymph node characteristics and extract features that in combination have high negative predictive value for excluding malignancy.

METHOD AND MATERIALS

Retrospective study evaluating 437 patients from the COPDGene® study who on initial CT scan had reported pulmonary nodule and either had documented lung cancer (n=81) or documented benign nodules at 5 year followup (n=356). Nodules were reviewed and characterized on initial CT scans by two independent readers using features previously shown to be associated with intrapulmonary lymph nodes. Multivariate analysis was used to extract features best suited to distinguish malignant nodules and benign nodules determined either from 5 year CT follow up or clinical history pertaining to cancer location in patients with known malignancy. Combination of pertinent features were then used to predict likelihood a nodule was a benign intrapulmonary lymph node and optimal cutoffs were determined to eliminate nodules likely to be intrapulmonary lymph nodes. Determined cutoffs were then applied to both LUNG-RADS and Fleischner Society guidelines to see potential impact on the same patient population.

RESULTS

Multivariate analysis showed that the presence of lymph node characteristics had strong negative predictive value for malignancy. Using optimized cutoffs (Sensitivity 97%, Specificity 38%, NPV 99%, PPV 13%), up to 51% of characterized pulmonary nodules could be excluded from further follow up without impacting management of patients with lung cancer. When management strategy for these patients was simulated based on LUNG-RADS or Fleischner criteria, inclusion of lymph node characteristics was found to result in a potential 5% reduction in CT utilization for LUNG-RADS and 37% for Fleischner criteria.

CONCLUSION

Excluding nodules which have high probability for being an intrapulmonary lymph node from further followup could have significant impact on CT utilization with little to no clinical impact on patient outcomes.

CLINICAL RELEVANCE/APPLICATION

Using lymph node characteristics in conjunction with LUNG-RADS and Fleischner Criteria guidelines might decrease CT utilization without having significant effect on patient outcomes.

SSC03-09 Novel Ultralow Dose (ULD) X-ray Evaluation of Lung Nodules Using Dual Energy and Digital Tomosynthesis Technologies

Monday, Nov. 28 11:50AM - 12:00PM Room: S404CD

Participants
Shailaja Sajja, MS, Toronto, ON (*Presenter*) Research funded, Carestream Health, Inc
Samuel Richard, PhD, Rochester, NY (*Abstract Co-Author*) Employee, Carestream Health, Inc
Xiaohui Wang, PhD, Rochester, NY (*Abstract Co-Author*) Employee, Carestream Health, Inc
Levon Vogelsang, Rochester, NY (*Abstract Co-Author*) Employee, Carestream Health, Inc
Nathan Packard, PhD, Rochester, NY (*Abstract Co-Author*) Employee, Carestream Health, Inc
Narinder S. Paul, MD, Toronto, ON (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Carestream Health, Inc

PURPOSE

Dual-energy (DE) x-ray could improve nodule detection by tissue discrimination. Digital tomosynthesis (DT) x-ray could improve nodule detection by spatial discrimination. The purpose of this study is to evaluate ULD DE and low-dose DT as alternatives to chest radiography (DR) and low dose CT (LDCT) for detection and characterization of lung nodules.

METHOD AND MATERIALS

Study 1 – Solid lung nodule: 4, 5, 6, 8 and 10mm spheres (100 HU) were placed in an anthropomorphic chest phantom and imaged with DR, DE and DT x-rays. DE x-rays were acquired with fixed and differential filtration. DT x-rays (DT100%) were acquired at a reference dose 8 times the exposure of a PA chest DR. DT30% and DT50% were also acquired. Imaging performance was evaluated

quantitatively and compared using detectability metrics (d') that were normalized by dose to provide dose efficiency metrics (d'norm).Study 2 – Ground Glass Nodule (GGN): GGN can represent inflammation, infection or low-grade adenocarcinoma. These pathologies can vary in the extent of tissue edema. The performance characteristics of chest DR, DE and DT for GGN were tested with A) ~2 cmcotton wool spheres varying in water content (simulated GGN) and B) 4, 5, 6, 8 and 10mm spheres (-800HU). A) and B) were placed into the anthropomorphic chest phantom and imaged using DR, DE, and DT followed by low dose CT (1mSv) using a wide volume CT: 320 x 0.5mm detector configuration, 135kV, 40mA, 0.5s GR. The CT images served as a reference standard.

RESULTS

To date:Study 1 – (d',d'norm) values were (1.2,0.7) and (1.3,1.1) for DE acquired with fixed and differential filtration. (d',d'norm) values were (11.8,7.8), (14.6,7.7) and (18.1,5.9) for DT30%, DT50% and DT100%. The values were normalized such that d'=d'norm=1 for DR.Study 2 – DT is superior to DR and DE in demonstrating GGN irrespective of water content.

CONCLUSION

DE and DT have superior detection performance per unit dose compared to DR. DT becomes anatomical noise limited (not dose limited) below DT50%. Differential filtration is a more dose-efficient technique for DE acquisition compared to fixed filtration.

CLINICAL RELEVANCE/APPLICATION

DE and DT x-ray have superior performance to DR, and comparable performance to LDCT for detection and characterization of lung nodules with significant reduction in radiation dose.

CHS-MOA

Chest Monday Poster Discussions

Monday, Nov. 28 12:15PM - 12:45PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Carol C. Wu, MD, Houston, TX (*Moderator*) Author, Reed Elsevier

Sub-Events

CH245-SD-MOA1 Quantitative Shape Analysis of CT Images in Thymic Epithelial Tumors: Correlation with World Health Organization Classification

Station #1

Participants
Motohiko Yamazaki, MD, Niigata, Japan (*Presenter*) Nothing to Disclose
Kanako Yamana, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose
Takuya Yagi, Niigata City, Niigata Prefecture, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Ishikawa, MD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose
Hidefumi Aoyama, MD, PhD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In diagnostic imaging, shape evaluation plays an important role in predicting tumor aggressiveness. This study aimed to differentiate CT features of low- and high-risk thymic epithelial tumors using quantitative shape analysis derived from a computer software.

METHOD AND MATERIALS

This retrospective study included 46 consecutive patients with 47 thymomas or thymic cancers. Tumor segmentation on CT images was manually performed on each axial section with a thickness of less than or equal to 3 mm. Subsequently, whole tumor volume, surface area, and quantitative shape parameters including circularity, sphericity, solidity, and convexity were calculated using a computer software. These quantitative shape parameters reflect the complexity, and a low value indicates that a tumor shape is complex. Furthermore, as conventional CT findings, the presence of lobulation, irregular contour, internal heterogeneity, and cystic or necrotic change was visually evaluated. Differences between low- and high-risk thymic epithelial tumors were statistically assessed by the Student's t-test or Fisher's exact test, and factors with $P < 0.10$ underwent multivariate logistic regression analysis. Discriminating performance was calculated by area under the receiver operating characteristic curves (AUC).

RESULTS

Based on the World Health Organization classification, 21 were low-risk tumors (4 type A, 9 type AB, and 8 type B1 thymomas) and 26 were high-risk tumors (12 type B2 and 7 type B3 thymomas and 7 thymic cancers). Compared to low-risk tumors, high-risk tumors had significantly lower values of circularity, sphericity, solidity, and convexity ($P < 0.05$). For conventional CT findings, only the presence of heterogeneity was significantly associated with high-risk tumors ($P < 0.05$). Multivariate analysis revealed that lower solidity at the maximum cross-section of the tumor (2D solidity) was an independent factor to predict high-risk tumors (odds ratio, 0.061; $P = 0.011$). Discriminating performance of 2D solidity was significantly higher than that of the whole tumor volume (AUC = 0.80 vs. 0.57; $P = 0.02$).

CONCLUSION

Quantitative shape analysis using a computer software can help differentiate low- and high-risk thymic epithelial tumors.

CLINICAL RELEVANCE/APPLICATION

Compared with visual CT evaluation, quantitative shape analysis using a computer software is a more objective method and may more accurately predict the aggressiveness of thymic epithelial tumors.

CH246-SD-MOA2 Intravoxel Incoherent Motion and Diffusion Kurtosis Diffusion Weighted Imaging in Lung: Capability for Quantitative Differentiation of Small-cell Lung Cancer from Non-small-cell Lung Cancer and Correlations with Lung Cancer Markers

Station #2

Awards
Student Travel Stipend Award

Participants
Yaru Tian, MBBCh, Beijing, China (*Presenter*) Nothing to Disclose
Tao Jiang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Hui Li, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Lu Liang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xin Ye, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Peng Peng, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yang Yu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Qinglei Shi, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Study the value of intravoxel incoherent motion (IVIM) diffusion weighted imaging (DWI) and diffusion kurtosis imaging (DKI) in differentiation of small-cell lung cancer (SCLC) from non-SCLC (NSCLC), and evaluate the relationship between IVIM and DKI-

derived parameters and lung cancer markers at 3.0T.

METHOD AND MATERIALS

Thirty-six patients with NSCLC (21 males and 9 females; mean age, 66.8 years) and 6 patients with SCLC (4 males and 2 females; mean age, 68.6 years) confirmed by hispathology were enrolled and underwent lung diffusion-weighted imaging MR exam. The protocol included routine MR exam and IVIM and DKI-DWI sequences before surgery or biopsy in a 10-month period (table 1). The IVIM-derived parameters were obtained by using prototype software provided by the manufacturer (Siemens Healthcare) and DKI-derived parameters were obtained by using an in-house developed software program based on a computing language and interactive environment (MATLAB; Mathworks, Natick, Mass). ADC maps were calculated automatically on machine. Independent-Samples T test was used to compare the difference between SCLC and NSCLC group. The relationship between IVIM and DKI-derived parameters and lung cancer markers was assessed by using the Pearson correlation test. Receiver operating characteristic (ROC) analysis of discrimination between SCLC and NSCLC was performed for K, Dkur, Divim and ADC values.

RESULTS

Dkur, Divim and ADC values all were significantly lower in SCLC group than NSCLC group ($P<0.05$). The positive correlation seems existed between Dkur and CYFRA211 ($r=0.360$, $P=0.026$), D* and proGRF ($r=0.329$,$P=0.041$) and negative correlation seems existed between ADC and NSE ($r=-0.301$, $P=0.032$). ROC analysis demonstrated a higher AUC for Dkur [0.956±0.031,(0.842 to 0.996)] and D [0.867±0.0691,(0.725 to 0.953)] than for ADC [0.848±0.0601,(0.702 to 0.941)] ($P>0.05$), the AUC of K was [0.777±0.071, (0.619 to 0.891)].

CONCLUSION

IVIM and DKI-derived parameters of lung showed better diagnostic performance than ADC values in differentiating SCLC from NSCLC, and significant correlation was observed between quantitative parameters and some lung cancer markers.

CLINICAL RELEVANCE/APPLICATION

Intravoxel incoherent motion (IVIM) diffusion weighted imaging (DWI) and diffusion kurtosis imaging (DKI) may differentiate small-cell lung cancer (SCLC) from non-SCLC (NSCLC) which may provide vital information in making therapy strategy of lung cancer.

CH247-SD-MOA3 Imaging Trends in Acute Venous Thromboembolic Disease: 2000-2015

Station #3

Awards
Student Travel Stipend Award

Participants
Isaac Wang, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Matthew S. Davenport, MD, Cincinnati, OH (*Abstract Co-Author*) Royalties, Wolters Kluwer nv; ;
Ella A. Kazerooni, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To correlate imaging utilization for suspected acute venous thromboembolism (VTE) in inpatients and emergency department (ED) patients with landmark publications and institutional care guidelines.

METHOD AND MATERIALS

Between 2000 and 2015, the number of CT pulmonary angiograms (CTPA) alone, CTPA combined with indirect CT venography (CTV) of the pelvis and lower extremities, ventilation/perfusion (V/Q) scans, and lower extremity venous Doppler examinations (US) were obtained from the hospital and radiology information systems for each calendar month for inpatients and ED patients, and correlated with landmark publications and release of institutional care guidelines.

RESULTS

Annual V/Q volume peaked in 2004-2005 (n=373 inpatient, n=1049 ED) and has decreased since. US volume steadily increased in both populations since 2002, and was higher than CT volume throughout the study period for inpatients (annual mean volume: n=4210 [US]; n=1196 [CT]), but not ED patients (annual mean volume: n=1082 [US]; n=1902 [CT]). Use of CTV with CTPA peaked at 51% of examinations in 2006. For ED patients, overall CTPA volume peaked in 2008, declined through 2012, then rose annually since, predominantly without CTV (8-28% rate 2012-2015). For inpatients, CTPA volume also peaked in 2008, but declined steadily since (n=1941 in 2008 vs. n=843 in 2015). PIOPED II was released in 2006, Brenner et al's landmark NEJM publication on CT-related radiation exposure was published in 2007, and an institutional inpatient VTE prophylaxis guideline was implemented with a hard-stop best-practice alert in 2008. While there was a sustained decline in CTPA utilization following 2008 for inpatients, the decline was temporary for ED patients.

CONCLUSION

Following the PIOPED II and Brenner et al. publications, there was a transient 4-year decline in CTPA utilization for ED patients that reversed course in 2012. This decline was sustained through the end of the study period (2015) in the inpatient setting, where a hard-stop best-practice alert was incorporated into the electronic medical record system.

CLINICAL RELEVANCE/APPLICATION

A best-practice alert incorporated into an electronic medical record system can more successfully sustain imaging best practices than the influence of major landmark publications.

Honored Educators

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Ella A. Kazerooni, MD - 2014 Honored Educator

CH249-SD-MOA5 Airway Dimensions in Current and Former Smokers: An Independent Predictor of Airflow Obstruction and Respiratory Quality of Life in Chronic Obstructed Pulmonary Disease

Station #5

Participants
Jean-Paul Charbonnier, Nijmegen, Netherlands (*Presenter*) Employee, Thirona BV
Esther Pompe, MD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Camille Moore, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Stephen Humphries, Denver, CO (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation
Bram Van Ginneken, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV; Research Grant, MeVis Medical Solutions AG; Research Grant, Delft Imaging Systems; Research Grant, Toshiba Corporation;
David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc
Barry J. Make, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Eva M. Van Rikxoort, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV

PURPOSE

We investigated the relationship between airway dimensions and airflow obstruction and respiratory quality of life in current and former cigarette smokers.

METHOD AND MATERIALS

Cigarette smokers were studied that enrolled in the COPDGene study. Spirometry assessment included forced expiratory volume in 1 sec (FEV1), forced vital capacity (FVC), % predicted FEV1 (FEV1%-p), % predicted FVC (FVC%-p), and peak expiratory flow (PEF). Respiratory quality of life was assessed by the St George's Respiratory Questionnaire (SGRQ) score and 6 Minute Walking Distance (SMWD).Inspiratory CT was available to extract the airways, the amount of emphysema, and the total lung capacity (TLC). Lumen perimeters and airway wall areas were automatically extracted perpendicular to the airways. Linear regression was performed on these measurements to calculate an index score of airway wall thickness, expressed as the square root of wall area at airways with a perimeter of 10mm (Pi10). Emphysema was defined as the percentage of low-attenuation area below -950 HU (LAA%-950).Multiple linear regression was used to determine the predictive value of Pi10 and smoking status on airflow obstruction and respiratory quality of life. An interaction was included in the model to investigate if the effect of Pi10 differed by smoking status. All models were adjusted for age, gender, body mass index, pack years, bronchodilator responsiveness, TLC, and LAA%-950.

RESULTS

1544 cigarette smokers (894 former smokers) were included, with a mean age of 60.7 ± 8.9 years and a mean Pi10 of 2.23 ± 0.57mm. Pi10 was significantly associated with all airflow obstruction and respiratory quality of life measures (all $p<0.001$). The interaction between Pi10 and smoking status was significant for all measures except FVC%-p ($p=0.30$) and SGRQ score ($p=0.064$). This indicates that the effect of Pi10 on FEV1%-p, PEF, FEV1/FVC and SMWD was significantly reduced in current smokers compared to former smokers.

CONCLUSION

Pi10 independently contributes to airflow obstruction and respiratory quality of life. This effect is stronger in former smokers as compared to current smokers.

CLINICAL RELEVANCE/APPLICATION

Pi10 is an independent marker for airflow obstruction and respiratory quality of life and may be more strongly associated with these outcomes in former smokers than current smokers.

CH142-ED-MOA6 How Does Smoking Tobacco Affect the Lungs? Radiopathologic Correlation

Station #6

Participants
Maria Magdalena Serra Salas, MD, Barcelona, Spain (*Presenter*) Nothing to Disclose
Xavier Gallardo, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Marta Andreu, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Eva Castaner, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Maria R. Escoda, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Joseph M. Mata, MD, PhD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Carles G. Zaragoza, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose
Carlota C. Rodriguez, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To describe and illustrate the radiologic findings in the different types of interstitial lung diseases related to smoking. To point out the most important radiologic criteria for the diagnosis of the different types of interstitial lung diseases and to relate these criteria to the histologic findings.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION: Cigarette smoking is recognized as a risk factor for interstitial lung disease. HRCT is sensitive in detecting interstitial lung disease and characterizing it into distinct individual entities. However, the clinic, radiologic, and histologic features of these entities overlap, and mixed patterns can coexist in the same patient.**REVIEW OF IMAGING FINDINGS:** Respiratory bronchiolitis - interstitial lung disease. Pulmonary Langerhans cell histiocytosis Desquamative interstitial pneumonia. Interstitial pneumonia combined with emphysema. Overlap and relationship between different interstitial smoking-related diseases.**SUMMARY:**The variety of interstitial diseases associated with cigarette smoking is wider than generally appreciated. HRCT allows us to evaluate the type, degree, extension, possible overlap, and evolution of these diseases. An integrated clinical, radiologic, and pathologic approach is necessary for accurate diagnosis of smoking-related interstitial disease.

Participants **Lung Resection Surgery: A Primer for Radiologists**
MOA7

Station #7

Divya Kumari, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Michael B. Shvarts, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Jonathan H. Chung, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
Luis A. Landeras, MD, Cleveland, OH (*Presenter*) Institutional Grant support, Koninklijke Philips NV

TEACHING POINTS

To understand the most common surgical approaches to lung surgery To familiarize with normal postoperative appearance in plain film radiography and computed tomography To review the most common complications

TABLE OF CONTENTS/OUTLINE

IntroductionTypes of Lung Resection Wedge Resection Segmentectomy Lobectomy Sleeve lobectomy PneumonectomyFlaps and Chest Wall ReconstructionComplications Pulmonary edema/ARDS Pneumonia Hemorrhage/hematoma Bronchopleural fistula Empyema Lobar torsion Gossypiboma Lung hernia Pulmonary artery stump thrombosis Postpneumonectomy Syndrome

Honored Educators

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Jonathan H. Chung, MD - 2013 Honored Educator

Lunch & Learn: Transitioning to DR, Clinical and Financial Benefits Beyond Preventing Reimbursement Penalties: Supported by Fujifilm (invite-only)

Monday, Nov. 28 12:30PM - 1:30PM Room: S403B

Participants

PARTICIPANTS

Jerry Thomas, MS, FAAPM, DABR, CHP, DABSNM Wichita, KS
William Tobin BS, Tyler, TX

PROGRAM INFORMATION

This course does not offer CME credit.

CHS-MOB

Chest Monday Poster Discussions

Monday, Nov. 28 12:45PM - 1:15PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Carol C. Wu, MD, Houston, TX (*Moderator*) Author, Reed Elsevier

Sub-Events

CH250-SD-MOB1 The Minimum Lung Area during Tidal Breathing on Magnetic Resonance Imaging (MRI) Correlates with the Prognosis of the Patients with Chronic Obstructive Pulmonary Disease (COPD)

Station #1

Participants
Tae Iwasawa, MD, PhD, Yokohama, Japan (*Presenter*) Research Consultant, Ono Pharmaceutical Co, Ltd.; Speaker, Shionogi & Co, Ltd
Akimasa Sekine, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Shinohara, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomohisa Baba, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Takashi Ogura, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshiyuki Gotoh, PhD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We investigated the correlation between the minimum lung area during tidal breathing on MRI and the prognosis of patients with chronic obstructive pulmonary disease (COPD).

METHOD AND MATERIALS

This study was approved by the review board . Written informed consent was obtained from the participants. The subjects were 35 male patients with COPD (age, 69.7 ± 6.2 years). We obtained 80 sagittal images of the right lung during tidal breathing by using MRI with a 1.5T unit and a balanced fast-field echo sequence. The image slice thickness was 10 mm, and acquisition time per image was 0.28 s. We measured lung area on 80 images by using an original system. We determined minimum lung area and divided it by predicted total lung capacity (TLC) to calculate the corrected- minimum lung area (minLA). We compared minLA with the initial pulmonary function tests, the ratio of low attenuation area under -950 HU (LAA%) on computer tomography (CT), and the St. George Respiratory Questionnaire (SGRQ) score by using Spearman's correlations. Cox regression analysis was used to examine the relationships between these parameters and overall survival.

RESULTS

The mean minLA was 46.2 cm2/cm3x10-5. This correlated well with forced expiratory volume in 1 s (FEV1, %) (correlation coefficient r=-0.756), residual volume (RV, %)(r=0.509), inspiratory capacity (IC, %)(r=-0.618), LAA% (r=0.559), and SGRQ total score (r=0.491). The median clinical follow-up period was 101 months (range: 7.3-124.4 months). One patient dropped out and six patients died during the follow-up period. Univariate Cox analysis showed the following significant predictors: minLA (p=0.004), IC (p=0.028), RV (p=0.033), LAA% (p=0.016). Multivariate analysis including minLA and LAA% identified minLA as a significant predictor of overall survival (p=0.014, hazard ratio =1.463, 95% confidence interval =1.082–1.979).

CONCLUSION

We think minLA will be a simple predictor of COPD patient's survival.

CLINICAL RELEVANCE/APPLICATION

MRI during tidal breathing requires no irradiation or no additional effort, therefore minLA is a gentle and steady measure for COPD patients.

CH251-SD-MOB2 Whole-lesion Apparent Diffusion Coefficient Histogram Analysis of Anterior Mediastinal Solid Tumors

Station #2

Participants
Takahiko Nakazono, MD, PhD, Saga, Japan (*Presenter*) Nothing to Disclose
Ken Yamaguchi, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryoko Egashira, MD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Imaizumi, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose
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Masanobu Mizuguchi, MD, Saga City, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Irie, MD, PhD, Saga, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the utility of whole-lesion apparent diffusion coefficient (ADC) histogram analysis in the diagnosis of anterior mediastinal solid tumors.

METHOD AND MATERIALS

In this retrospective study, a whole-lesion ADC histogram analysis was performed in 49 consecutive patients with thymomas (n=32), thymic carcinomas (n=8), malignant lymphomas (n=6), or germ cell tumors (n=3). The ADC histogram parameters (mean,

10th, 25th, 50th, 75th, and 90th percentile ADC values, kurtosis, and skewness) were calculated. These parameters were compared between the thymic epithelial tumors (TETs, n=40) and non-thymic epithelial tumors (non-TETs, n=9). In the thymomas that underwent surgical resection (n=29), the parameters were compared between the low-risk (n=15) and high-risk thymomas (n=14) and between the non-invasive (n=14) and invasive thymomas (n=15). The highest diagnostic performance of the parameters was evaluated by a receiver operating characteristic (ROC) analysis, and the area under the curve (AUC), sensitivity, specificity, and accuracy were calculated.

RESULTS

There were significant differences among the 25th, 50th, 75th and 90th percentile ADC values, and in the skewness between the TETs and non-TETs ($p<0.05$). The results of the ROC analysis showed that the diagnostic performance of the skewness was the highest for differentiating non-TETs from TETs. When the cutoff of skewness was 0.81, the following values were obtained: AUC 0.79, sensitivity 88.9%, specificity 72.5%, and accuracy 75.5%. There was no significant difference in the ADC histogram parameters between the low-risk and high-risk thymomas ($p>0.05$). There were significant differences in the mean ADC values and 10th, 25th, 50th, 75th, and 90th percentiles between the non-invasive and invasive thymomas ($p<0.05$). In the ROC analysis, the diagnostic performance of the 25th percentile ADC values was the highest for differentiating invasive thymomas from non-invasive thymomas. When the cutoff of 25th percentile ADC values was 1.44 × 10−3 mm2/s, the following values were obtained: AUC 0.82, sensitivity 93.3%, specificity 71.4%, and accuracy 82.8%.

CONCLUSION

The ADC histogram analysis revealed significant differences in parameters between the TETs and non-TETs and between the non-invasive and invasive thymomas.

CLINICAL RELEVANCE/APPLICATION

An ADC histogram analysis can be used to obtain additional information about the characterization of anterior mediastinal solid tumors.

CH252-SD-MOB3 Effectiveness of Lead Gloves for Radiation Protection during Percutaneous Transthoracic Lung Biopsy Guided by C-Arm Cone-Beam CT

Station #3

Participants
Yoon Kyung Kim, MD, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yon Mi Sung, MD, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Min Kyoung Lee, MD, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Chorong Seo, MD, Incheon, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jeong Ho Kim, MD, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hye-Young Choi, MD, PhD, Incheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the effectiveness of lead gloves for radiation protection during C-arm cone-beam CT guided percutaneous transthoracic lung biopsy.

METHOD AND MATERIALS

From February to November 2014, 112 percutaneous transthoracic lung biopsies were performed by two experienced thoracic radiologists under guidance of c-arm cone-beam CT, with using lead gloves (n=57) or without using lead gloves (n=55). Optically-stimulated luminescence dosimeters were attached to the dorsum and ventral side of each hand of operators to measure the hand surface dose during the procedure. The total fluoroscopy time, radiation dose to the patient, lesion characteristics and biopsy results were recorded for each procedure.

RESULTS

Mean surface dose was significantly lower in lead glove group ($p<0.001$, 0.0176±0.0172 mGy vs. 0.0260±0.0131 mGy at the right dorsum; 0.0290±0.0248 mGy vs. 0.0497±0.0353 mGy at the right ventral side; 0.0195±0.0152 mGy vs. 0.0298±0.0171 mGy at the left dorsum; 0.0192±0.0099 mGy vs. 0.0523±0.0429 mGy at the left ventral side). The dose reduction with the gloves was 45.9% in average (32.3% at the right dorsum, 63.2% at the left ventral side). There was no significant difference between lead glove group and control group in the total fluoroscopy time ($p=0.208$, 1.57±0.76 minutes vs. 2.06±2.84 minutes), radiation dose to the patient ($p=0.845$, 88.9±68.6 mGy vs. 92.7±129.4 mGy), lesion size ($p=0.080$, 3.9±2.5 cm vs. 4.6±2.1 cm), lesion depth from the skin ($p=0.192$, 4.3±1.5 vs. 4.8±1.9 cm cm), lesion depth from the pleura ($p=0.587$, 2.0±1.0 cm vs. 1.8±1.2 cm). False negative result was observed in 5 of lead glove group (8.7%) and 12 of control group (21.8%) ($p=0.096$). Development of pneumothorax (5/57 vs. 3/55, $p=0.753$) or hemoptysis (1/57 vs. 1/55, $p=0.491$) was not significantly different between two groups.

CONCLUSION

Lead gloves have a radiation attenuation effect of 32.3-63.2% during c-arm cone-beam CT guided transthoracic lung biopsy without affecting the accuracy or safety.

CLINICAL RELEVANCE/APPLICATION

Considering the trend of increasing demand of transthoracic percutaneous lung biopsy, appropriate radiation protection to the hands during procedure is important.

CH253-SD-MOB4 Noise Reduction Filtering Improves Repeatability of Quantitative Lung Density Metrics Between Full and Reduced-dose CT Scans

Station #4

Participants
Charles Hatt, Delafield, WI (*Presenter*) Employee, Imbio, LLC
Craig J. Galban, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

Stephen Humphries, Denver, CO (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation
David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc
Meilan K. Han, Ann Arbor, MI (*Abstract Co-Author*) Consultant, Boehringer Ingelheim GmbH; Consultant, GlaxoSmithKline plc; Consultant, Novartis AG; Consultant, AstraZeneca PLC; Royalties, UpToDate, Inc

PURPOSE

Lung cancer screening offers an additional opportunity to screen for computed tomography (CT) based imaging biomarkers associated with emphysema. It is important to understand how decreasing the radiation dose affects the repeatability of lung densitometry measures compared to those obtained from full-dose scans, and if noise-reduction filtering can help improve repeatability. The aim of this study was to quantify the repeatability of quantitative lung density metrics using full dose (FD) and reduced dose (RD) CT acquisitions of the same patient obtained during the same study. It was hypothesized that 1) RDCT would have a higher average %LAA and a lower Perc15 than the corresponding FDCT scan and 2) noise reduction filtering would decrease this bias as well as the variation between the measurements.

METHOD AND MATERIALS

As part of the COPDGene study, 179 patients were scanned at inspiration using the standard FD protocol (200 mAs, B31f or STD kernel). Next, a repeat scan was obtained with dose modulation at a lower dose (mAs range 40-80, B31f or STD kernel). The lung was segmented from the images using Imbio LDA software. Ventilation differences between scans were corrected using a dry-sponge model method. Each RDCT image was then processed with a 3x3x3 neighborhood median filter. Lung density was quantified as low-attenuation area less than -950 HU (%LAA) and 15th percentile HU (Perc15).

RESULTS

Mean and 95% confidence interval (CI95) of differences in biomarker metrics between scans were calculated with and without noise reduction filtering. Bland-Altman analysis was used to examine the effect of baseline %LAA and Perc15 on the measurement difference. The mean ± CI95 differences between FDCT and unfiltered RDCT were 5.9%±7.1% for %LAA and -15.2 HU ± 12.0 HU for Perc15. The differences in %LAA and Perc15 between FDCT and filtered RDCT were significantly lower (0.6%±2.4% and -2.9 HU ± 11.0 HU, respectively).

CONCLUSION

Noise reduction filtering improves repeatability of lung density metrics between FDCT and LDCT scans, which is important for determining the reliability of quantitative biomarker measurements associated with emphysema in a lung-cancer screening context.

CLINICAL RELEVANCE/APPLICATION

Noise reduction filtering can be used to correct for differences in measurements between FDCT, the clinical gold standard, and RDCT, which is recommended for patients undergoing yearly lung cancer screening CT exams.

CH254-SD-MOB5 Clinical Significance of Indeterminate Pulmonary Nodules in Patients with Melanoma

Station #5

Participants
Magdy M. Soliman, MBBCh, FRCR, Toronto, ON (*Presenter*) Nothing to Disclose
Teresa Petrella, MD,FRCPC, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Frances Wright, MD, MEd, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Nicole Look Hong, MD,MSc, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Laura Jimenez-Juan, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Anastasia Oikonomou, MD, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Followup algorithms for pulmonary nodules in melanoma patients are controversial and largely left to institutional preference. This study aims to determine the clinical significance of indeterminate pulmonary nodules in patients with melanoma.

METHOD AND MATERIALS

This retrospective cohort study included consecutive patients surgically treated with localized melanoma. Patients with definitely benign nodules, definite pulmonary or extrapulmonary metastases and other non-melanoma malignancies were excluded. Nodules were volumetrically measured on sequential follow-up CTs (median interval between CTs: 4 months (3-9)) and a cut-off of 15% difference in volume was considered as increase or decrease in size. Distance from pleura, peripheral versus central location, perifissural location, irregularity, solid density, cavitation were evaluated. Nodules were considered metastases on follow-up CT if they increased in size on 2 sequential CTs, if increase in size was accompanied by development of new pulmonary nodules and/or extrapulmonary metastases or based on histology.

RESULTS

Out of 584 melanoma patients surgically managed at our institution between September 2012-2015, 277 had baseline chest CT. 53 patients, (29 female), median age 62 yrs (range: 24-84) with indeterminate pulmonary nodules at baseline CT were identified. 188 nodules - median volume:0.0252 cm3, median distance from pleura: 2 mm, 37 perifissural, 165 peripheral in location and 166 with solid density - were evaluated for a median period of 15 months (range: 6-33). 124 pulmonary nodules remained stable, 10 resolved, 42 decreased in size, 11 increased less than 15%. Only one nodule doubled its size in 3 months and was proven to be metastatic (0.5%). During follow-up 6 newly developed nodules in a median interval period of 7 months (range: 3-26) were confirmed metastatic in a short-term 3 month follow up CT.

CONCLUSION

Indeterminate pulmonary nodules in melanoma patients at baseline chest CT were extremely rarely metastatic (0.5%) and in this case a 3 month follow-up CT confirmed increase in size. Newly developed nodules during follow up confirmed to be metastatic in a 3 month follow-up CT.

CLINICAL RELEVANCE/APPLICATION

Indeterminate pulmonary nodules at baseline CT in melanoma patients are almost always benign and a 3 month follow-up CT will most likely confirm their metastatic nature otherwise.

CH144-ED-MOB6 Don't Be Nervous: An Overview of the Anatomy and Pathology of the Nerves of the Thorax

Station #6

Awards

Certificate of Merit

Participants
Rishi Agrawal, MD, Chicago, IL (*Presenter*) Speakers Bureau, Boehringer Ingelheim GmbH
Nishant D. Parekh, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Hatice Savas, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Larry Cochard, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Eric M. Hart, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

After viewing this exhibit, the learner will be able to:
(1) Identify the course of the major nerves in the thorax
(2) Recognize imaging characteristics of nerve dysfunction in the thorax
(3) Recognize pertinent clinical history suggesting nerve dysfunction in the thorax
(3) Anticipate nerve dysfunction based on anatomic localization of thoracic lesions

TABLE OF CONTENTS/OUTLINE

I. Anatomy and function
- A. Esophageal plexus
- B. Intercostal nerves
- C. Long Thoracic nerves
- D. Phrenic nerves
- E. (White) Ramus communicans
- F. Recurrent laryngeal nerves
- G. Splanchnic nerves
- H. Sympathetic chain
- I. Vagus nervesII. Pathology
- A. Neoplasm and other soft tissue impingement
- B. Inflammatory lesions
- C. Injury (trauma and iatrogenic)

MSCT21

Case-based Review of Thoracic Radiology (An Interactive Session)

Monday, Nov. 28 1:30PM - 3:00PM Room: S100AB

CH

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

Participants
Diana Litmanovich, MD, Haifa, Israel, (dlitmano@bidmc.harvard.edu) (*Director*) Nothing to Disclose

Sub-Events

MSCT21A Congenital Thoracic Pathology

Participants
Edward Y. Lee, MD, MPH, Boston, MA, (Edward.Lee@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss various congenital thoracic pathology that occurs in children. 2) Review imaging modalities for evaluating congenital thoracic pathology in children. 3) Learn characteristic imaging findings of congenital thoracic pathology in children.

MSCT21B Smoking Related Lung Disease

Participants
Brent Little, MD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the typical imaging appearances of smoking related lung disease, with attention to computed tomography. 2) Appreciate both "classic" and more recently described smoking related lung diseases, with a focus on problem solving and differential considerations.

ABSTRACT

MSCT21C Pulmonary Infections

Participants
Christian J. Herold, MD, Vienna, Austria (*Presenter*) Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Agfa-Gevaert Group; Research Grant, Bracco Group; Research Grant, Guerbet SA; Speakers Bureau, Bayer AG; Speakers Bureau, Bracco Group; Stockholder, Hologic, Inc

LEARNING OBJECTIVES

1) Discuss, in a case-based review, the etiologic, clinical, and microbiologic factors that influence the presentation of pulmonary infections. 2) Illustrate typical and atypical presentations of pulmonary infections at imaging. 3) Understand the spectrum of non-infectious entities that potentially mimic pulmonary infections. 4) Utilize all available clinical and radiologic information to arrive at a comprehensive diagnosis when pulmonary infection is suspected.

MSMC23

Cardiac CT Mentored Case Review: Part III (In Conjunction with the North American Society for Cardiovascular Imaging) (An Interactive Session)

Monday, Nov. 28 1:30PM - 3:00PM Room: S406A

CA CH CT

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

Participants
Jill E. Jacobs, MD, New York, NY (*Director*) Nothing to Disclose
Elliot K. Fishman, MD, Baltimore, MD, (efishman@jhmi.edu) (*Moderator*) Institutional Grant support, Siemens AG; Institutional Grant support, General Electric Company;
U. Joseph Schoepf, MD, Charleston, SC, (schoepf@musc.edu) (*Moderator*) Research Grant, Astellas Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; Consultant, Guerbet SA; ; ;

LEARNING OBJECTIVES

1) Identify cardiac and coronary artery anatomy. 2) Recognize cardiac disease processes, including coronary atherosclerosis, as diagnosed on CT. 3) Understand methods of cardiac CT and coronary CT angiography post-processing.4)understand the role of coronary artery calcium scoring

ABSTRACT

Sub-Events

MSMC23A Pulmonary Veins and Pericardial Disease

Participants
Jacobo Kirsch, MD, Weston, FL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe normal versus anomalous pulmonary venous anatomy. 2) Understand the imaging findings of complications of ablation for atrial fibrillation. 3) Describe abnormalities of the pulmonary veins identifiable on routine CT. 4) Identify the most common pericardial abnormalities evaluated with CT.

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/

Jacobo Kirsch, MD - 2013 Honored Educator

MSMC23B Coronary Atherosclerosis III

Participants
Elliot K. Fishman, MD, Baltimore, MD (*Presenter*) Institutional Grant support, Siemens AG; Institutional Grant support, General Electric Company;

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

The goal of this session is to learn how to interpret pathology involving the coronary arteries beyond the detection of coronary artery stenosis. Focus on exam acquisition protocols, study interpretation protocols, and minimizing radiation dose are addressed. Specific topics addressed will also include coronary artery aneurysm, myocardial bridging, anomalous coronary arteries as well as vasculitis. Potential pitfalls will be addressed and pearls for study optimization will also be discussed.

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/

Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Elliot K. Fishman, MD - 2016 Honored Educator

SSE05

Chest (Emphysema and Airway Disease)

Monday, Nov. 28 3:00PM - 4:00PM Room: S402AB

CH CT

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
David A. Lynch, MBBCh, Denver, CO (*Moderator*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc
Santiago E. Rossi, MD, Capital Federal, Argentina (*Moderator*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH

Sub-Events

SSE05-01 CT-Based Models for Prediction of Chronic Obstructed Pulmonary Disease and Smoking-related Morbidity in Cigarette Smokers

Monday, Nov. 28 3:00PM - 3:10PM Room: S402AB

Participants
Jean-Paul Charbonnier, Nijmegen, Netherlands (*Presenter*) Employee, Thirona BV
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Stephen Humphries, Denver, CO (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation
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Barry J. Make, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Eva M. Van Rikxoort, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV

PURPOSE

To predict COPD and smoking-related morbidity in cigarette smokers using quantitative CT (QCT) measures.

METHOD AND MATERIALS

1544 subjects were included from the COPDGene study. COPD was defined by a ratio of forced expiratory volume in 1 sec. (FEV1) and forced vital capacity (FVC) < 0.7. Smoking-related morbidity was defined as FEV1/FVC < 0.70 with either a St George's Respiratory Questionnaire score ≥ 25 or an exacerbation frequency ≥ 2/year.On inspiratory CT, multiple cross-sectional lumen perimeters and airway wall areas were extracted from the airways. Using linear regression, airway wall thickness was defined as the square root of wall area of an airway with a perimeter of 10mm (Pi10). Total lung capacity (TLC) and emphysema were measured on inspiratory CT, where emphysema was defined as the % of low-attenuation areas (LAA%) < -950HU (LAA%-950). Air-trapping was defined on expiratory CT as LAA% < -856HU (LAA%-856).Six logistic regression models were fitted for both the prediction of COPD and smoking-related morbidity using a random subset of 761 subjects. Model 1 included only age, gender, BMI, pack years, smoking status, and TLC, while models 2 to 6 additionally included: LAA%-950 (model 2), LAA%-856 (model 3), Pi10 (model 4), LAA%-950 + Pi10 (model 5), and LAA%-950 + LAA%-856 + Pi10 (model 6). The models were validated on a separate set (810 subjects) using the area under the receiver operating curve (AUC).

RESULTS

The validation set consisted of 369 subjects with and 441 without COPD. QCT measures were independent predictors of COPD in all models ($p<0.001$), with AUC values for models 1 to 6 of 0.77, 0.85, 0.90, 0.87, 0.91, and 0.93, respectively. The validation set consisted of 216 subject with and 594 without smoking-related morbidity. QCT measures were independent predictors of smoking-related morbidity in all models ($p<0.001$, except for LAA%-950 in model 5), with AUC values for models 1 to 6 of 0.72, 0.83, 0.87, 0.83, 0.88, and 0.89, respectively.

CONCLUSION

LAA%-950, LAA%-856, and Pi10 are independent predictors of COPD and smoking-related morbidity. The model including only inspiratory QCT predictors has similar predictive value to the model that also includes expiratory air-trapping.

CLINICAL RELEVANCE/APPLICATION

Since LAA%-950 and Pi10 can be readily extracted from inspiratory images, these measures may be useful to predict smoking related morbidity in lung cancer screening.

SSE05-02 Spectrum of Pulmonary Parametric Response Maps in Asthmatic Patients: A Promising Innovative Tool in Defining Asthma Subtypes

Monday, Nov. 28 3:10PM - 3:20PM Room: S402AB

Awards

Trainee Research Prize - Fellow

Participants
Mariaelena Occhipinti, MD, Florence, Italy (*Presenter*) Nothing to Disclose
Charles Hatt, Delafield, WI (*Abstract Co-Author*) Employee, Imbio, LLC
Leonello Fuso, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Martina Sbarra, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Lorenzo Bonomo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Macis, MD, PhD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carola Condoluci, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pulmonary parametric response map (pPRM) was validated for quantitative densitometric phenotypization of COPD.Similar to COPD,asthma is a heterogeneous disease that could benefit from differentiation into subtypes.Thus we aimed to study the spectrum of densitometric classification of pPRM in a group of asthmatic patients.

METHOD AND MATERIALS

Between September 2014 and March 2015 25 patients with persistent asthma were enrolled after IRB approval.They underwent clinical evaluation,respiratory function tests (RFT),and spirometrically monitored chest CT:one scan at total lung capacity and one at residual volume.Images were analyzed by using specific software for airway analysis (Thoracic VCAR, GE) and specific software for pPRM (Imbio, MN),based on automated co-registration of paired inspiratory and expiratory scans.Co-registration analysis distinguished 3categories of lung parenchyma:normal lung (NL),persistent airway disease (pAD),and functional airway disease (fAD).Joint density histograms (JDH) were also obtained.Airway analysis was performed in each patient in 6proximal bronchi (2nd and 3rd generation).Correlations between quantitative imaging data and functional data were calculated.

RESULTS

Airway analysis and pPRM were obtained in all 25 patients,but 3/25 (12%) cases for incomplete segmentation.pPRM spectrum was 92.1±12.1% NL, 0.3±0.5% pAD, and 7.6±11.8% fAD. Correlation of fAD with FEV1/FVC and FEF25-75% was 0.68 and 0.63,respectively.Correlation of peak value of JDH with the same clinical parameters was higher (0.77 and 0.78).Peak values of JDH identified 2 different groups:severe asthma cases had less than 704HU vs mild-moderate asthma cases had greater than 704HU.Slope of major axis of JDH was lower in cases with mild-moderate asthma compared to severe cases.

CONCLUSION

This is the first study using pPRM in asthmatic patients.pPRM correlated strongly with RFT and clinical severity of asthma.A threshold of 704 HU in peak value on JDH distinguished cases of severe asthma from mild-moderate ones.Additional analysis on JDH parameters could further characterize patients with severe asthma,providing new insights into underlying disease mechanisms and evidence for forthcoming personalized treatments.

CLINICAL RELEVANCE/APPLICATION

pPRM is a fast and automated CT analysis to characterize patients with asthma. JDH parameters may offer new insights into asthma subtypes,helpful for forthcoming personalized treatments.

SSE05-03 Progression of Lobe-Specific Emphysema in Cigarette Smokers with and without COPD

Monday, Nov. 28 3:20PM - 3:30PM Room: S402AB

Participants
Esther Pompe, MD, Utrecht, Netherlands (*Presenter*) Nothing to Disclose
Firdaus Mohamed Hoesein, MD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Eva M. Van Rikxoort, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV
Camille Moore, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc
Matthew J. Strand, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Jan-Willem J. Lammers, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate whether the association between changes in emphysema and changes in forced expiratory volume in one second (FEV1) differ between lung lobes in cigarette smokers with and without chronic obstructive pulmonary disease (COPD).

METHOD AND MATERIALS

Subjects who participated in the Genetic Epidemiology of COPD (COPDGene) study and had completed the second phase at 5-year follow-up were included. All subjects underwent inspiratory computed tomography (CT). The amount of emphysema was evaluated with the adjusted lung density. This method is based on the 15th percentile method (Perc15: the Hounsfield Unit value of which below 15% of the lung voxels are distributed). After adding 1000 to Perc15 and adjusting for inspiration level, emphysema was quantified per lobe. Linear mixed models were used to test whether changes in FEV1 were associated with changes in epmhysema per lobe, while correcting for age, pack-years, BMI, gender, race, smoking status, scanner make, scanner model, and study center.

RESULTS

1,656 subjects were included. A total of 801 (48.4%) subjects had airflow obstruction. Average change of emphysema per lobe that is not accounted for by ageing or changes in other demographics from visit 1 to visit 2 was: -2.6% ($p<0.001$) in the left upper lobe (LUL); -2.8% ($p<0.001$) in the left lower lobe (LLL); -3.2% ($p<0.001$) in the right upper lobe (RUL); -3.7% ($p<0.001$) in the right middle lobe (RML); -3.2% ($p<0.001$) in the right lower lobe (RLL). The association of FEV1 decline with epmhysema progression was largest in LLL and RUL (LUL: decrease of 4.6% per 1L decline, $p=0.002$; LLL: decrease of 5.6% per 1L decline, $p<0.001$; RUL: decrease of 5.2% per 1L decline, $p=0.001$; RML: decrease of 1.6% per 1L decline, $p=0.26$; RLL: decrease of 4.5% per 1L decline, $p<0.001$).

CONCLUSION

Progression of emphysema was most prominent in the right lung, but the relationship between change in emphysema and FEV1 decline was largest in LLL and RUL. Therefore, evaluating lobe-specific progression of emphysema might have implications for treatment and prognosis.

CLINICAL RELEVANCE/APPLICATION

Understanding the difference in rates of progression of emphysema between lung lobes may be important in evaluating treatment and underlying pathophysiology.

SSE05-04 Combined Assessment of Emphysema, Air Trapping and Airway Wall Thickening at Lobar Level using CT of COPD: Studies on Inter-relation of each Measurement and Contribution of Parameters on Pulmonary Functional Loss

Monday, Nov. 28 3:30PM - 3:40PM Room: S402AB

Participants
Cherry Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joon Beom Seo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Namkug Kim, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Stockholder, Coreline Soft, Inc
Sang Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Young Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jae Seung Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yeon-Mok Oh, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the relationships between quantitative CT measurements of emphysema, air trapping, and airway wall thickening in each lobe of the lung and to analyze the contribution of CT parameters with pulmonary function test (PFT) in chronic obstructive lung disease (COPD).

METHOD AND MATERIALS

Inspiratory and expiratory CT scans of 84 subjects in Korean obstructive Lung Disease (KOLD) cohorts were evaluated. Measures examined included emphysema (percentage of low attenuation areas ≤-950HU on inspiratory CT [LAA%]), dynamic air trapping (percentage of subtracted low-attenuation areas ≤60HU using inspiration CT and co-registered expiration CT [ATI]). After the segmentation of the whole airways in the lung and systemic assessment of all airway segments, square root of the wall area of a hypothetical airway of 10-mm internal perimeter (Pi-10) and wall area percent (WA%) were measured. Correlations between CT measurements at lobar level were assessed. Linear regression analysis was applied to evaluate the contribution of LAA%, ATI and WA% of both upper lobes (BUL) and both lower lobes (BLL) to PFT.

RESULTS

The significant correlations between CT measurements were different in each lobe (Table1). In BUL, LAA% showed significant correlation with both Pi-10 (r=-.172, p=.027) & WA% (r=-.285, p<.001). In BLL, both LAA% & ATI were significantly correlated with both Pi-10 (LAA%, r=-.235, p=.002; ATI, r=.2, p=.01) & WA% (LAA%, r=-.188, p=.016; ATI, r=.252, p<.001). The contribution of CT measurements in BUL and BLL differed per lung function parameter (Table2). For FEV1, LAA% of BLL and WA% of BUL were contributing factors, while for FEV1/FVC these were LAA% & WA% of BUL and LAA% & ATI of BLL. LAA% of both BUL & BLL were contributing factors for DLCO. For FEF 25-75%, LAA% of BUL and LAA% & ATI of BLL were contributing factors. RV and RV/TLC were influenced by LAA% of BUL and LAA%, ATI, WA% of BLL.

CONCLUSION

Relationship among CT measurements in each lobe was different and the contribution of the CT measurements differed per lung function parameter between BUL and BLL.

CLINICAL RELEVANCE/APPLICATION

Our study showed that CT measurements of emphysema, air trapping, and airways in COPD were different according to each lobe and the contribution of CT measurements differed per lung function parameter, probably due to the different dynamics and physiology in each lobe of the lung. Therefore, we emphasize the importance of the lobe-based analysis of CT parameters.

SSE05-05 Different Correlation between CT Parameters and FEV1 according to the Disease Severity in COPD

Monday, Nov. 28 3:40PM - 3:50PM Room: S402AB

Participants
Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joon Beom Seo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Namkug Kim, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Stockholder, Coreline Soft, Inc

PURPOSE

To know whether the correlations between computed tomography (CT) parameters and forced expiratory volume in one second (FEV1) are different according to the disease severity in chronic obstructive pulmonary disease (COPD) and whether CT parameters can better explain severity of airflow limitation by subgroup analysis approach

METHOD AND MATERIALS

Study population included 370 COPD patients with various disease severity (GOLD criteria I; n=117, II; n=139, III; n=98 and IV; n=16). Those patients were divided into mild (GOLD I and II) and severe subgroups (GOLD III and IV). At inspiration volumetric CT, which were available in all patients, the volume fraction of voxels less than -950 Hounsfield unit (HU) in the lung (emphysema index,

EI) and relative wall thickening of both apical subsegmental bronchi (wall area percentage, WA%) were measured using in-house software. The correlation between the CT parameters (EI and WA%) and FEV1, which was assessed within 1 week from the CT examination, was assessed in the total patients, mild and severe subgroups using Pearson correlation method. Linear regression analysis with backward selection was followed to evaluate the relative contribution of each CT parameter to the change of airflow limitation.

RESULTS

The correlation coefficients between EI and FEV1 in the total, mild, and severe subgroups were -0.40, -0.15, and -0.46, respectively (all $p<0.05$). The correlation coefficients between WA% and FEV1 in the total, mild, and severe subgroups were -0.18, -0.14, and 0.01, respectively. In comparison to statistically significant correlation in the total patients and mild subgroup, the WA% values in severe subgroup did not correlate with FEV1. At linear regression analysis, while both EI and WA% were turned out to be independent contributors of airflow limitation in the total patients and mild subgroup, only EI was selected in severe subgroup.

CONCLUSION

Airway wall thickening and emphysema might relate and/or contribute differently to airflow limitation in COPD according to the disease severity.

CLINICAL RELEVANCE/APPLICATION

Combined analysis of EI and WA% followed by subgroup application can better explain pulmonary functional loss. Further study to build up nonlinear model would be of value to better understand the interrelations between morphological changes to functional loss in COPD patients.

SSE05-06 Xenon-Enhanced Area-Detector CT vs. Ventilation SPECT/CT: Utility of Functional and Morphological Assessments for Pulmonary Functional Loss and Disease Severity in Smokers

Monday, Nov. 28 3:50PM - 4:00PM Room: S402AB

Participants
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
Yuji Kishida, MD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Hisanobu Koyama, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation
Yasuko Fujisawa, MS, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Naoki Sugihara, MEng, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Erina Suehiro, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshinori Sekitani, MS, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Negi, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To prospectively and directly compare the utility of xenon-contrast enhanced area-detector CT (Xe-ADCT) for pulmonary functional and disease severity assessments in smokers, when compared with ventilation SPECT/CT.

METHOD AND MATERIALS

46 consecutive smokers (32 male and 14 female; mean age, 68 year old) underwent prospective unenhanced and xenon-enhanced ADCTs, krypton ventilation SPECT/CT and pulmonary function tests. Xe-ADCT was generated from unenhanced and xenon-enhanced ADCT. According to pulmonary function test results, all smokers were divided into 4 groups as follows: 'Non-COPD', 'Mild COPD', 'Moderate COPD' and 'Severe or Very Severe COPD' groups. For each method, regional ventilation was assessed by 10-point scoring system on a per-lobe basis. Then, ventilated lung volume (VLV) on each method, functional lung volume (FLV) and wall area percent (WA%) in each subject were calculated according to past literatures. To evaluate the capability of each index for pulmonary functional loss assessment, all indexes were correlated with %FEV1 by univariate and step-wise regression analyses. To compare each index among all groups, Tukey's HSD test were performed.

RESULTS

All indexes had significant correlations with %FEV1 (VLV on Xe-ADCT: $r=0.67$, $p<0.00001$; FLV: $r=0.55$, $p<0.0001$; WA%: $r=-0.50$, $p=0.0004$; VLV on SPECT/CT: $r=0.59$, $p<0.0001$). In the step-wise regression test, %FEV1 ($r=0.62$, $p<0.00001$) was significantly affected by the following three factors: the first-step factor, VLV on Xe-ADCT; the second-step factor, WA%; the third-step factor, FLV. All indexes of 'Non-COPD' and 'Mild COPD' groups had significant difference with those of 'Severe or Very Severe COPD' groups ($p<0.05$), and all indexes except VLV on SPECT/CT had significant difference between 'Moderate COPD' and 'Severe or Very Severe COPD' groups. VLVs on Xe-ADCT and SPECT/CT had significant differences between 'Non-COPD' and 'Moderate COPD' groups ($p<0.05$).

CONCLUSION

Functional and morphological evaluations on xenon-enhanced ADCT had equal to or better capabilities for pulmonary functional and disease severity assessments in smokers as compared with ventilation SPECT/CT.

CLINICAL RELEVANCE/APPLICATION

Functional and morphological evaluations on xenon-enhanced ADCT had equal to or better capabilities for pulmonary functional and disease severity assessments in smokers as compared with ventilation SPECT/CT.

MSCT22

Case-based Review of Thoracic Radiology (An Interactive Session)

Monday, Nov. 28 3:30PM - 5:00PM Room: S100AB

CH

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

Participants
Diana Litmanovich, MD, Haifa, Israel, (dlitmano@bidmc.harvard.edu) (*Director*) Nothing to Disclose

Sub-Events

MSCT22A Airway Disorders

Participants
Diana Litmanovich, MD, Haifa, Israel, (dlitmano@bidmc.harvard.edu) (*Presenter*) Nothing to Disclose

MSCT22B Post-surgical Thoracic Disorders

Participants
Jo-Anne O. Shepard, MD, Boston, MA, (jshepard@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The radiologist will be familiar with the expected and unexpected appearance in patients following thoracic surgical procedures.
2) The radiologist will be able to identify specific complications on chest radiography and CT in the post-operative patient.

ABSTRACT

1.Understand the expected post-operative appearance of commonly performed thoracic surgical procedures.2. Be familiar with unexpected complications following thoracic surgical procedures and recognize their imaging features.3. Apply knowledge of complications learned to clinical practice.

MSCT22C Non-Traumatic Emergencies of the Thorax

Participants
Jeffrey P. Kanne, MD, Madison, WI, (kanne@wisc.edu) (*Presenter*) Research Consultant, PAREXEL International Corporation; Advisory Board, F. Hoffmann-La Roche Ltd

LEARNING OBJECTIVES

1) Identify chest radiographic findings associated with acute non-traumatic thoracic emergencies. 2) Define the role of CT in the evaluation of non-traumatic thoracic emergencies. 3) Describe the CT findings of acute aortic syndrome.

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/

Jeffrey P. Kanne, MD - 2012 Honored Educator
Jeffrey P. Kanne, MD - 2013 Honored Educator

SPDL21

RSNA Diagnosis Live™: Chest and Abdomen

Monday, Nov. 28 4:30PM - 6:00PM Room: E451B

CH GI

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

Participants

Paul J. Chang, MD, Chicago, IL (*Presenter*) Co-founder, Stentor/Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Medical Advisory Board, lifeIMAGE Inc; Advisory Board, Bayer AG
Neety Panu, MD, FRCPC, Thunder Bay, ON (*Presenter*) Nothing to Disclose
Gregory L. Katzman, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

URL

ED003-TU

Chest Tuesday Case of the Day

Tuesday, Nov. 29 7:00AM - 11:59PM Room: Case of Day, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants

Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
Paola J. Orausclio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Joaquina Paz Lopez Moras, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Danielle H. Carpenter, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Kimberly G. Kallianos, MD, San Franicsco, CA (*Abstract Co-Author*) Nothing to Disclose
Graham M. Wallace, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Bram Geurts, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC
Agustina Agnetti, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lekshmi Santhosh, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) To analyze interesting chest cases. 2) To understand appropriate differential diagnosis. 3) To understand the clinical significance of the diagnosis presented.

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/

Santiago E. Rossi, MD - 2015 Honored Educator
Travis S. Henry, MD - 2016 Honored Educator

MSRO34

BOOST: Lung-Oncology Anatomy (An Interactive Session)

Tuesday, Nov. 29 8:30AM - 10:00AM Room: S103CD

CH RO

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

Participants

Meng X. Welliver, MD, Columbus, OH, (meng.welliver@osumc.edu) (*Moderator*) Nothing to Disclose
Michelle S. Ginsberg, MD, New York, NY (*Presenter*) Nothing to Disclose
Gregory Videtic, MD, FRCPC, Cleveland, OH, (videtig@ccf.org) (*Presenter*) Nothing to Disclose
Feng-Ming Kong, MD, PhD, Augusta, IN (*Presenter*) Research Grant, Varian Medical Systems, Inc; Speaker, Varian Medical System, Inc; Travel support, Varian Medical System, Inc

LEARNING OBJECTIVES

1) Review the Radiologist's approach to thoracic anatomy that impacts treatment decision making in the treatment of lung cancer regarding tumors and proximity to great vessels/heart; involvement of airway/esophagus/chest wall; involvement of diaphragm/pericardium/phrenic nerve; involvement of vertebral column; and mediastinal and hilar nodes. 2) Understand the terminology used by Radiation Oncologists when defining targets for treatment and normal structures for avoidance including a) review the contouring of gross tumor volume (GTV), clinical target volume (CTV), and planning target volume (PTV) for stereotactic body radiotherapy for medically inoperable early stage non-small cell lung cancer; b) review the contouring of gross tumor volume (GTV), clinical target volume (CTV), and planning target volume (PTV) for conventional external beam radiotherapy for non-metastatic non-small cell lung cancer and small cell lung cancer. c)review the contouring of, and standardized definitions for, critical organs at risk (OARs) in the thorax: e.g. esophagus, brachial plexus, heart, airways, lungs, as they relate to definitive radiotherapy

ABSTRACT

Lung Cancer is a challenging disease to treat. It typically presents in advanced stage and even in the curative setting, the normal structures in the thorax make it challenging to treat with radiotherapy because of their inherent sensitivity. In this course, the Radiologist's perspective will inform a review the normal anatomy of the chest and how its structures relate to, and can predict, the acute and late manifestations of radiotherapy on these organs and tissues. Then, the parameters by which Radiation Oncologists design their treatment targets in order to maximize treatment of cancer and minimize injury to organs-st-risk will be reviewed.

RC301

Non-Vascular Thoracic MR: Ready for Prime Time!

Tuesday, Nov. 29 8:30AM - 10:00AM Room: E451A

CH MR

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

FDA Discussions may include off-label uses.

Participants
Jeanne B. Ackman, MD, Boston, MA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss what it takes to build a non-vascular thoracic MR practice. 2) Create simple mediastinal, pleural, and lung protocols which answer clinical questions. 3) Become more comfortable interpreting these various types of non-vascular thoracic MR examinations.

ABSTRACT

Despite MRI's long-demonstrated advantages regarding tissue contrast and diagnostic specificity and its absence of radiation, MRI remains an underutilized imaging modality for thoracic evaluation. The aim of this course is to cover the basics needed to build a non-vascular thoracic MR practice and to perform and interpret thoracic MRI, whether of the mediastinum, the pleura, or the lung. Fast and robust examination protocols, applicable and ready to use on currently available MR equipment, will be shared. Clinical indications for thoracic MRI and commonly encountered lesions will be discussed, with the goal of further improving patient care.

Sub-Events

RC301A Building a Clinical Program

Participants
Jeanne B. Ackman, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the challenges to building a clinical non-vascular thoracic MR practice. 2) Understand how to surmount these challenges. 3) Outline a multifaceted approach to building a practice. 4) Understand the benefit of building a clinical non-vascular thoracic MR practice.

ABSTRACT

There are many challenges to building a clinical non-vascular thoracic MR practice, many of which can be surmounted by: 1) identifying a knowledgeable and capable radiologist within your practice to take this initiative and build a team of interested colleagues to move forward2) educating technologists, referring physicians, trainees, and colleagues as to its performance, interpretation, and benefits,3) building a few simple MR protocols which can answer most clinical questions,4) regularly sharing MR cases to enhance the knowledge of your group,5) patience and recognition of the fact that those in your group insufficiently trained in thoracic MRI may not at first be comfortable with protocoling, interpreting, and recommending these examinations; these colleagues will need to be convinced of MR's benefits and, if interested, will be open to learning what they need to learn to maximize the benefits that can be achieved for patient care as a result of MR's higher tissue contrast, diagnostic specificity, and lack of ionizing radiation.

RC301B MRI of the Pleura: Value Added

Participants
Jeanne B. Ackman, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss MR's added value beyond computed tomography for pleural lesion assessment in terms of tissue characterization, diagnostic specificity, gauging extent of disease, and guidance to the surgeon. 2) Outline the essential components of a basic pleural MR protocol. 3) Discuss typical features of various cystic and solid pleural lesions.

ABSTRACT

MRI adds value beyond computed tomography (CT) with regard to tissue characterization, diagnostic specificity, assessment of extent of pleural disease, and guidance to the thoracic surgeon. This brief lecture will cover the basics of pleural MR imaging and interpretation and show how pleural MR imaging can improve patient care. Typical features of various cystic and solid pleural lesions, including mesothelioma, solitary fibrous tumors, endometriomas, intrapleural bronchogenic cysts, and extralobar sequestration, will be discussed.

RC301C MRI of the Lung: The Ace Up the Sleeve

Participants
Jurgen Biederer, MD, Heidelberg, Germany, (biederer@radiologie-darmstadt.de) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Estimate the diagnostic scope of lung MRI for evaluation of the lung parenchyma and airways. 2) Appreciate the diagnostic yield

of MRI for the evaluation and characterization of lung nodules and the detection of malignancy. 3) Consider MRI as potential first choice modality for imaging and follow up of pulmonary disease in young and/or pregnant patients--e.g. cystic fibrosis. 4) Discuss the potential role of lung MRI as an alternative or adjunct to other modalities--e.g. in COPD or interstitial lung disease.

ABSTRACT

Besides X-ray and CT, MRI of the lung can play an interesting role as "the ace up the sleeve" in your clinical practice. The sensitivity of MRI for infiltrates is at least similar to X-ray and CT, lung nodule detection is superior to X-ray and slightly inferior to CT and unique options for tissue characterization (exclusion of malignancy) and functional imaging capacities (perfusion, ventilation, respiratory motion) are available with standardized protocols. Given this, MRI may serve as a radiation-free alternative in patients who should not be exposed to ionizing radiation (children and young subjects, pregnant patients), e.g. as your first choice modality in patients with cystic fibrosis. It may well serve as an adjunct to other modalities for comprehensive lung imaging in COPD and some cases of interstitial lung diseases, e.g. sarcoidosis (dark lymph node sign). In young patients, it may well be used for the long term follow-up of malignancy (e.g. seminoma) or inflammatory disease (e.g. GPA/Wegener's disease). As an adjunct or alternative to other modalities, MRI can be helpful in lung cancer staging and follow-up (differentiation of atelectasis and lung cancer) or the characterization of lung nodules ("actionable nodules" with contrast uptake, high NPV of nodules with no or low contrast uptake, fatty content in hamartoma). Finally, MRI might even play a role in early detection of lung cancer, either as the screening tool or for the further diagnostic work-up of detected lesions.

RC301D Practical Mediastinal MRI

Participants
Constantine A. Raptis, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify scenarios in which MRI is helpful in the evaluation of patients with known or suspected mediastinal pathology. 2) Discuss the components of efficient MRI protocols for the evaluation of mediastinal pathologies. 3) Understand key imaging findings which can be encountered on MRI examinations of the mediastinum.

ABSTRACT

While CT has long been the primary imaging modality for cross sectional evaluation of the thorax, MRI has emerged as a complimentary, and in some cases superior, means of evaluating mediastinal pathologies. This presentation will discuss the role MRI plays in the evaluation of mediastinal pathologies, focusing on important indications, protocol components, and imaging findings. This information will remain centered on practical aspects of mediastinal MRI that can be readily applied in any practice setting. Ultimately, the goal of this presentation is to give the audience the framework needed to utilize mediastinal MRI to improve patient care.

RC308

Emergency Radiology Series: Imaging of Thoracic and Related Emergencies

Tuesday, Nov. 29 8:30AM - 12:00PM Room: N230B

CH ER

AMA PRA Category 1 Credits ™: 3.50
ARRT Category A+ Credits: 4.00

Participants
Martin L. Gunn, MBChB, Seattle, WA, (marting@uw.edu) (*Moderator*) Research Grant, Koninklijke Philips NV; Royalties, Cambridge University Press; Spouse, Consultant, Reed Elsevier; Spouse, Consultant, athenahealth, Inc; ;
Stephen Ledbetter, MD, Boston, MA (*Moderator*) Nothing to Disclose

Active Handout:Martin Lee David Gunn

http://abstract.rsna.org/uploads/2016/16000652/RC308 Gunn Aortic Injury.pdf

Sub-Events

RC308-01 Esophageal Emergencies

Tuesday, Nov. 29 8:30AM - 9:00AM Room: N230B

Participants
Francis J. Scholz, MD, Burlington, MA, (francis.j.scholz@lahey.org) (*Presenter*) Owner, FSpoon Company

LEARNING OBJECTIVES

After this presentation the radiologist will:Understand how to optimally examine for pharyngeal and esophageal trauma using fluoroscopyRecognize and stage trauma as either A. Mucosal Tear B Intramural Dissection C Transmural Tear

ABSTRACT

Esophageal trauma is common in practice and includes a broad spectrum of clinical and radiologic entities including perforation, hematoma, and foreign body ingestion that must be recognized promptly in order to reduce morbidity and mortality. Imaging findings are often subtle or may not be demonstrable by conventional radiography or CT. Recognizing subtle fluoroscopic findings of disease may avoid additional work up including more invasive endoscopy.Radiologists frequently perform esophageal fluoroscopy for not only possible spontaneous trauma but also complex post-surgical and endoscopic trauma. In addition, spontaneous or post traumatic pneumodemiatstinum or air in soft tissues of the neck lead to an urgent request to evaluate for esophageal perforation. This presentation will provide concise details of our fluoroscopic technique and the findings that permit staging of traumatic insults for clinical treatment choices, correlated with CT findings. Mucosal tears, intramural dissections, and transmural perforations are shown. Classic eponymic esophageal traumas - Boerhaave and Mallory Weiss - are discussed and illustrated.

ABSTRACT

Esophageal trauma is common in practice and includes a broad spectrum of clinical and radiologic entities including perforation, hematoma, and foreign body ingestion that must be recognized promptly in order to reduce morbidity and mortality. Imaging findings are often subtle or may not be demonstrable by conventional radiography or CT. Recognizing subtle fluoroscopic findings of disease may avoid additional work up including more invasive endoscopy.Radiologists frequently perform esophageal fluoroscopy for not only possible spontaneous trauma but also complex post-surgical and endoscopic trauma. In addition, spontaneous or post traumatic pneumodemiatstinum or air in soft tissues of the neck lead to an urgent request to evaluate for esophageal perforation. This presentation will provide concise details of our fluoroscopic technique and the findings that permit staging of traumatic insults for clinical treatment choices, correlated with CT findings. Mucosal tears, intramural dissections, and transmural perforations are shown. Classic eponymic esophageal traumas - Boerhaave and Mallory Weiss - are discussed and illustrated.

Active Handout:Francis Joseph Scholz

http://abstract.rsna.org/uploads/2016/16000653/rc30801 Esophageal Emergencies DONE 6p.pdf

LEARNING OBJECTIVES

1) Understand presentations of esophageal trauma that warrant prompt fluoroscopic imaging. 2) Know esophageal anatomy and structure required for fluoroscopic imaging. 3) Use techniques that optimally define esophageal pathology. 4) Diagnose esophageal trauma, and stage perforations.

ABSTRACT

Esophageal emergencies are common and the radiologist is a key member of the team involved in the diagnosis, staging, and treatment of many esophageal emergencies. CT and Fluoroscopy remain the principle diagnostic tools in patients with emergent esophageal symptoms.Introduction to esophageal perforation, fluoroscopy and CT technique, diagnostic findings, and staging concepts will be discussed and illustrated, including classic diagnoses: Taco Tear, Mallory Weiss, Boerhaave SyndromeSigns and symptoms of esophageal trauma: odynophagia, pain after endoscopy, neck crepitus, abnormal breath sounds.
PERFORATION ETIOLOGIES:Instrumentation and Surgery
Ingestion/vomiting: Mallory Weiss, Boerhaave, Taco Tear, often alcohol associated
Fragile mucosa: Bullous Dermatoses, Eosinophilic Esophagitis
Radiation Stricture
Caustic agentsTECHNIQUE:If critically ill: CT and/or straight to surgery. If not critically ill and high suspicion, fluoroscopy is the FIRST BEST TEST for esophageal trauma. It is best suited for finding subtle intramural perforations and for severity staging.FLUOROSCOPY:Review prior swallow, find prior stricture site
Water-soluble, 90 cc, 4/s AP pharynx; 1/sec AP Esophagus.
If negative: bariumEsophagus: 1/s, upright AP, LAO and prone LPO.Pharynx: 4/s AP, LateralESOPHAGEAL TRAUMA STAGINGMucosal
Intramural

Transmural
Distant tracking, pleural and mediastinal inflammation

RC308-02 Chest Pain CT in the Emergency Department: Watch Out the Myocardium

Tuesday, Nov. 29 9:00AM - 9:10AM Room: N230B

Participants
Kai Higashigaito, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Ricarda M. Hinzpeter, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Stephan Baumueller, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Fabian Morsbach, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the frequency and significance of hypodense myocardium (HM) and coronary culprit lesions in chest-pain CT in the emergency department.

METHOD AND MATERIALS

In this IRB- and ethics committee approved study, ECG-triggered chest-pain CT examinations of 300 consecutive patients (mean age 59±17 years, 71% male) with acute chest pain referred to our emergency department for DRO (rule-out pulmonary embolism (PE) and aortic dissection (AD), n=179) and TRO (n=121) between 06/2012 and 11/2015 were retrospectively analyzed. Chest-pain CT for TRO was performed with s.l. nitroglycerine and without nitroglycerine for DRO. Each myocardial segment was assessed for the presence of hypodense myocardium (HM). Attenuation of HM was measured and compared to normal myocardium. Coronary arteries were searched for the presence of culprit lesions and coronary plaques were classified into non-calcified, mixed and calcified. Presence of positive remodeling was noted. Patient histories were reviewed for the indications of CT, cardiovascular risk factors, known previous myocardial infarction (MI), and final diagnosis causing acute chest pain.

RESULTS

HM was identified in 27/300 patients (9%): 12/179 in DRO-CT (7%) and 15/121 in TRO-CT (12%). Mean attenuation of HM (59±40HU) was significantly lower than that of healthy myocardium (112±20HU, $p<0.05$), with a mean difference of 83±32HU. In 16/27 patients (59%) with HM, the final diagnosis was acute MI, and in the remaining 11/27 patients (41%) previous MI was found in the patients' history. DRO-CT identified HM and the corresponding culprit lesion in 6/16 patients (37%) with a final diagnosis of acute MI. In 13/16 patients (81%), a culprit lesion causing MI was correctly identified and subsequently confirmed with catheter angiography. Of the identified 13 plaques in culprit lesions, 4 (31%) were non-calcified, 4 (31%) mixed, and 5 (38%) calcified. 9/13 (69%) plaques showed positive remodeling.

CONCLUSION

Hypodense myocardium and the culprit coronary lesion causing acute MI is encountered often in chest-pain CT examinations, even if only a DRO-CT was performed. This indicates that the myocardium should be analyzed for hypodense regions also if no dedicated CT of the coronaries and heart was asked for.

CLINICAL RELEVANCE/APPLICATION

Acute MI can be detected in both DRO- and TRO- chest-pain CT examinations and may facilitate the diagnostic workup of acute chest pain patients.

RC308-03 MDCT of Aortic Dissection

Tuesday, Nov. 29 9:10AM - 9:40AM Room: N230B

Participants
Stephen Ledbetter, MD, Boston, MA, (sledbetter@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

To optimize imaging approach for the ED patient
To review the typical CT imaging findings
To understand the spectrum of disease

RC308-04 Novel CT Predictors of Type A Aortic Dissection

Tuesday, Nov. 29 9:40AM - 9:50AM Room: N230B

Awards
Student Travel Stipend Award

Participants
Nigel R. Munce, MD,PhD, Hamilton, ON (*Presenter*) Founder, Conavi Medical Inc; Shareholder, Conavi Medical Inc
Michael N. Patlas, MD, FRCPC, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Ali Alsagheir, MD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Forough Farrokhyar, DPhil, PhD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Dominic Parry, MD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively evaluate the clinical relevance of novel MDCT parameters in patients with type A aortic dissection when compared to a control group having MDCT for the evaluation of thoracic aorta.

METHOD AND MATERIALS

An IRB- approved retrospective review of patients presenting with Type A aortic dissection at our institution (n=51 with available

MDCT) was conducted from January 2008 - January 2016. MDCT parameters measured were: length of the ascending aorta (AA), maximal AA diameter, aortic root diameter, the left ventricular outflow tract (LVOT) angle (the angle between an imaginary line drawn at right angles to the plane of the aortic annulus and a second line representing the transverse plane) and the cardiac apex (CA) angle (the angle between an imaginary line drawn from left ventricular apex to the mid point of the aortic valve and a second line representing the transverse plane). Similar measurements were performed in an age and gender matched control group (n=76). Statistical comparison were made with Student's t-tests.

RESULTS

51 cases of acute Type A dissection with available MDCT were identified (mean age= 61; M:F= 35:16). Review of 123 urgent CTs of the complete aorta yielded 76 cases without significant acute aortic pathology or prior thoracic aortic intervention which served as age and gender matched controls. The mean length of the ascending aorta in the Type A dissection population versus control group was 12.00 vs 9.27 cm ($p < .0001$). The maximal aortic diameter was 4.97 vs 3.15 cm ($p < .0001$) and aortic root diameter was 4.35 vs 2.89 cm ($p<.001$). The LVOT and CA angles were both significantly less in the type A dissection group measuring 31.70 vs 44.13 degrees ($p< .0001$) and 20.44 vs 30.34 degrees ($p <.0001$), respectively.

CONCLUSION

Our study shows, for the first time to our knowledge, that there is a statistically significant increase in the length of the ascending aorta in patients with Type A dissection as compared to control group. We also demonstrate that there is a decrease in the angle of the LVOT and CA angle.

CLINICAL RELEVANCE/APPLICATION

AA length, LVOT angle and CA angle are significantly different in patients with Type A dissection as compared to a control group and thus may serve as novel predictors for type A aortic dissection.

RC308-05 Morphological Changes between Acute and Chronic Type B Communicating Aortic Dissection on MDCT: A Retrospective Study

Tuesday, Nov. 29 9:50AM - 10:00AM Room: N230B

Participants
Yumi Imamura, Tokyo, Japan (*Presenter*) Nothing to Disclose
Satoru Morita, MD, PhD, Shinjuku-ku, Japan (*Abstract Co-Author*) Nothing to Disclose
Shuji Sakai, MD, Shinjuku-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

No reports have systematically clarified the differences between acute and chronic type B communicating aortic dissection on computed tomography (CT), though such clarification is sometimes required clinically. Thorough understanding of these differences from disease onset is important for determining optimal therapeutic methods and accurately estimating the prognosis. The purpose of this study was to compare the morphological changes between acute and chronic type B communicating aortic dissection on multidetector row CT (MDCT).

METHOD AND MATERIALS

We analyzed 21 patients with type B communicating aortic dissection who underwent acute-phase contrast-enhanced MDCT. The flap curvature, flap thickness, long and short diameter of the aorta, and false lumen length were measured at a representative portion of the descending aorta. The numbers of slices with 5-mm thickness with a fluttering flap, calcification on the flap, and thrombosis in the false lumen were counted. These findings in the acute and chronic phases before any intervention (median 0 and 181 days after onset) were compared using the Mann–Whitney U test.

RESULTS

The mean flap curvature in the acute phase was significantly larger than in the chronic phase (66.0 ± 18.0 vs. 35.5 ± 30.9 1/m, $p = 0.009$). The median number of slices with a fluttering flap in the acute phase was larger than in the chronic phase (10 vs. 1, $p = 0.008$). The mean ratio of the long to short diameter in the acute phase was relatively lower than in the chronic phase (1.07 ± 0.06 vs. 1.14 ± 0.12, $p = 0.073$). The mean ratio of the false lumen length to long diameter in the acute phase was significantly lower than in the chronic phase (0.41 ± 0.10 vs. 0.59 ± 0.16, $p < 0.001$). No significant differences in the mean flap thickness, median number of slices with calcification on the flap, and median number of slices with thrombosis in the false lumen were observed (2.4 ± 0.5 vs. 2.7 ± 0.6, $p = 0.176$; 8 vs. 10, $p = 0.651$; and 2 vs. 12, $p = 0.086$).

CONCLUSION

Acute and chronic type B communicating aortic dissection can be differentiated on MDCT. Findings suggestive of acute phase are a curved flap, flap fluttering, and complete round shape of the descending aorta.

CLINICAL RELEVANCE/APPLICATION

MDCT findings of a curved flap, flap fluttering, and complete round shape of the descending aorta suggest the acute rather than chronic phase of type B communicating aortic dissection.

RC308-06 Aortic MRA Can Guide ED Management of Suspected Acute Aortic Dissection

Tuesday, Nov. 29 10:00AM - 10:10AM Room: N230B

Participants
Gary X. Wang, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Sandeep S. Hedgire, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Thang Le, MD, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose
Jonathan Sonis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brian Yun, MD,MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael H. Lev, MD, Boston, MA (*Abstract Co-Author*) Consulant, General Electric Company; Institutional Research Support, General Electric Company; Stockholder, General Electric Company; Consultant, MedyMatch Technology, Ltd; Consultant, Takeda Pharmaceutical Company Limited; Consultant, D-Pharm Ltd

Ali Raja, MD, MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Anand M. Prabhakar, MD, Somerville, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Though ACR Appropriateness Criteria recommends MRA for suspected acute aortic dissection when CTA is not possible, the feasibility and utility of this strategy in the ED is unclear. This study examines the indications and outcomes of MRA in suspected acute aortic dissection evaluation in the ED.

METHOD AND MATERIALS

This study was completed in an urban, academic Level 1 trauma center. An IRB approved retrospective electronic medical record review identified patients who underwent MRA in the ED for suspected acute thoracic aortic dissection from 2010-2015. Age, gender, clinical assessment, CTA contraindications, MRA results, clinical outcomes, and times of ED arrival and dismissal, and of MRA completion were analyzed.

RESULTS

47 patients (mean age 58 years old) underwent MRA: 19 (40%) due to iodinated contrast allergy, 21 (45%) due to renal insufficiency (eGFR < 30 ml/min/1.73 m² or clinical concern for declining renal function), 2 (4%) due to both, 2 (4%) to spare ionizing radiation, 2 (4%) for further work-up after CTA, and 1 (2%) due to prior contrast-enhanced CT within 24 hours. Mean ED arrival to MRA completion time was 381±279 min. 40 studies were fully diagnostic; 7 were limited. Two (4%) patients had acute dissection on MRA and 45 (96%) had negative exams. 18 (38%) received gadolinium: 14 (78%) had iodinated contrast allergy and none had renal insufficiency. 29 (62%) patients did not receive gadolinium: 21 (72%) had renal insufficiency and 2 (6%) were on hemodialysis; 7 (24%) had iodinated contrast allergy. No significant difference exists in ability to achieve a fully diagnostic MRA with or without gadolinium ($p = 0.225$, Fisher's exact test). 16 (34%) of patients were discharged home from the ED; 2 (4%) were admitted for acute dissection seen on MRA and 29 (62%) for further evaluation after dissection was excluded or to manage an alternative diagnosis.

CONCLUSION

MRA has a clear role in the evaluation for acute thoracic aortic dissection in the ED, where it can guide management and facilitate safe discharge to home. Nearly all MRA exams in this study cohort were performed when CTA was not possible, which follows ACR Appropriateness Criteria and demonstrates its feasibility in the ED.

CLINICAL RELEVANCE/APPLICATION

With increased MRI availability in the ED, MRA can be useful in evaluating suspected acute aortic dissection in ED patients unable to undergo CTA and can allow for safe discharge to home.

RC308-07 Advanced Imaging of Traumatic Thoracic Aortic Emergencies

Tuesday, Nov. 29 10:10AM - 10:40AM Room: N230B

Participants
Martin L. Gunn, MBChB, Seattle, WA, (marting@uw.edu) (*Presenter*) Research Grant, Koninklijke Philips NV; Royalties, Cambridge University Press; Spouse, Consultant, Reed Elsevier; Spouse, Consultant, athenahealth, Inc; ;

Active Handout:Martin Lee David Gunn

http://abstract.rsna.org/uploads/2016/16000655/ACTIVE RC308 07.pdf

LEARNING OBJECTIVES

1) Review multi-modality imaging findings of traumatic thoracic aortic injuries. 2) Describe the most appropriate use of CT in the patient at risk of traumatic aortic injury. 3) Explain recent advances in the understanding of blunt aortic injuries, and current evidence-based management. 4) Identify imaging pitfalls and explain how to differentiate "pseudo-disease" from a true injury.

ABSTRACT

RC308-08 The Incidence and Effect on Mortality of Costochondral Fractures in Blunt Polytrauma Patients- A Review of 1461 Consecutive Whole Body CT Studies for Trauma

Tuesday, Nov. 29 10:40AM - 10:50AM Room: N230B

Awards
Student Travel Stipend Award

Participants
Mari Nummela, MD, Helsinki, Finland (*Presenter*) Nothing to Disclose
Frank Bensch, MD, PhD, Helsinki, Finland (*Abstract Co-Author*) Nothing to Disclose
Seppo K. Koskinen, MD, PhD, Stockholm, Sweden (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the incidence of costal cartilage fractures (CCfx's) in blunt polytrauma patients, related injuries, trauma mechanism and mortality.

METHOD AND MATERIALS

All patients with a history of blunt trauma in a level I trauma center over a period of 36 months were included. All whole body CT (WBCT) studies were initially double read and retrospectively reviewed by a board certified radiologist blinded to initial reports.

RESULTS

A total of 1461 WBCT studies were found, of which 574 (39%) had thoracic injuries (M 425; 74.0%, mean age 46.6 (range 18-91), F 149; 26.0%, mean age 48.9 (range 18-97)). Of these, 118 patients (M 101; 85.6%, mean age 48.8 (range 18-84), F 17; 14.4%

mean age 47.4 (range 20-82)) had a total of 225 CCfx's. The incidence of CCfx's was 8.1% (118/1461) in all WBCT studies and 20.6% (118/574) in thoracic trauma patients. CCfx's were categorized as costochondral (101; 44.9%), midchondral (112; 49.8%) or costosternal (12;5.3%). Costal cartilages of ribs 6 (37/225; 16.4%) and 7 (38/225; 16.9%) were most commonly injured. Multiple CCfx's were found in 50% (59/118) and 16/118 patients (13.6%) had bilateral CCfx's. No correlation between CC calcifications and fractures was found. However, posttraumatic calcifications were seen adjacent or in the fracture line on follow up CT-studies of 16 patients starting from 21 days after initial trauma. No internal mammary or subclavian artery injuries were detected. Acute traumatic aortic injury was rare (4/118; 3.4%). Multiple bony rib fx's occurred in 96 cases of 118 (81.4%) of which 42 cases had bilateral fx's. Associated intrathoracic injuries were pneumothorax (76; 64.4%), hemothorax (61; 51.7%), and pulmonary contusions (62; 52.5%). Intra-abdominal injuries were seen in 29 patients (24.6%). The main trauma mechanisms were MVA (40; 33.9%) and fall (34; 28.8%). The 30-day mortality of patients with CCfx's was 7.63% (9/118) in comparison to 4.61% (21/456) of patients with no CCfx's (OR 1.71, 95% CI (0.762-3.839)).

CONCLUSION

Costochondral fractures are common in blunt thoracic trauma. CC fx's are related to high-energy trauma; patients with CCfx's had a slightly higher mortality rate than thoracic trauma patients with no CCfx's.

CLINICAL RELEVANCE/APPLICATION

Costochondral fractures increase rib cage instability and often contribute to the formation of a flail chest. They are usually painful and may impair respiratory function of chest trauma patients.

RC308-09 Prognostic Value of CT-derived Left Atrial and Left Ventricular Measures in Patients with Acute Chest Pain

Tuesday, Nov. 29 10:50AM - 11:00AM Room: N230B

Participants
Paul Apfaltrer, MD, Vienna, Austria (*Presenter*) Nothing to Disclose
Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
U. Joseph Schoepf, MD, Charleston, SC (*Abstract Co-Author*) Research Grant, Astellas Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; Consultant, Guerbet SA; ; ;
John W. Nance JR, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Richard A. Takx, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to determine the prognostic value of computed tomography (CT)-derived measures of left ventricular (LV) and left atrial (LA) geometry and function for future major adverse cardiac events (MACE).

METHOD AND MATERIALS

We retrospectively analyzed data of 225 subjects who had undergone coronary CT angiography (CCTA) using a dual-source CT system for acute chest pain evaluation between September 2006 and March 2009. LV mass, LV ejection fraction (EF), LV end-systolic volume (ESV) and LV end-diastolic volume (EDV), LA ESV and LA diameter, septal wall thickness and cardiac chamber diameters were measured. MACE was defined as cardiac death, non-fatal myocardial infarction, unstable angina, or late revascularization. The association between cardiac CT measures and the occurrence of MACE was quantified using Cox proportional hazard analysis, adjusting for traditional risk factors (age, sex, body mass index, hypertension and Framingham risk score), coronary calcium score, and obstructive coronary artery disease on CCTA.

RESULTS

225 subjects (mean age±SD, 56.2±11.2; 140 males) were analyzed, of whom 42 (18.7%) experienced a MACE during a median follow-up of 13 months (range 9-17 months). LA diameter (HR: 1.07, 95% confidence interval [CI] 1.01-1.13 per mm) and LV mass (HR: 1.05, 95% CI 1.00-1.10 per gram) remained significant prognostic factor of MACE after controlling for Framingham risk score. LA diameter and LV mass were also found to have prognostic value independent of each other. The other morphologic and functional cardiac measures were no significant prognostic factors for MACE.

CONCLUSION

CT-derived LA diameter and LV mass are associated with future MACE in patients undergoing evaluation for chest pain, and portend independent prognostic value beyond traditional risk factors, coronary calcium score, and obstructive coronary artery disease on CCTA.

CLINICAL RELEVANCE/APPLICATION

The results of the study indicate that CT-derived left atrial diameter and left ventricular mass are prognostic markers of cardiovascular events in patients with acute chest pain independent of traditional risk factors, coronary calcium score, and obstructive coronary artery disease on coronary CT angiography.

RC308-10 Multi-modality Imaging of Deep Venous Thrombosis

Tuesday, Nov. 29 11:00AM - 11:30AM Room: N230B

Participants
Douglas S. Katz, MD, Mineola, NY, (dkatz@winthrop.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the multi-modality current imaging of deep venous thrombosis (DVT) of the upper and lower extremities. 2) To review the advantages and disadvantages of the individual modalities for imaging known or suspected DVT in the upper and lower extremities - ultrasound, CT, MR, and conventional venography. 3) To demonstrate typical and less typical examples of acute as well as chronic DVT. 4) To review the potential pitfalls in the imaging of DVT.

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/

Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator

RC308-11 A Review of Modified Well's Criteria Score as a Predictor of Lower Limb Venous Thromboembolism

Tuesday, Nov. 29 11:30AM - 11:40AM Room: N230B

Participants
Ronan Waldron, BMBCh, Galway, Ireland (*Abstract Co-Author*) Nothing to Disclose
Brian M. Moloney, MBBCh, Galway, Ireland (*Presenter*) Nothing to Disclose
Mary Clare Casey, Co Mayo, Ireland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We aim to assess the use of the Modified Wells Criteria (MWC) score as a determinant for eligibility for Doppler Ultrasound (DUS) and to determine the diagnostic accuracy of D-Dimers in positively predicting the presence of deep venous thrombosis (DVT)

METHOD AND MATERIALS

All patients who underwent lower limb DUS following suspicion of DVT between November 2012 and September 2014 were reviewed. Pre-imaging MWC score was recorded and D-Dimer result noted if performed.

RESULTS

A total of 764 patients underwent lower limb DUS. 415(54.3%) of patients involved were female. 10.34% (n=80) of those who underwent Lower Limb DUS had a positive finding of DVT. 364 patients had a MWC Score of 2, with a positive result in 23(6.32%). 257 patients had a MWC Score of 3, with a positive result in 24 (9.33%). 114 patients had a MWC score of 4, with a positive result for DVT identified in 21 (18.42%). 29 patients had a MWC score of 5, 9(31.01%) of whom had a DVT. 7 patients had a MWC score of 6, with a positive result for DVT in 3 (42.85%). The most common presenting symptoms were lower limb oedema (n= 731, 95.7%) and pain (n=715, 93.6%). D-Dimer was elevated in all cases it was performed (n=564 (73.8%)). A mean elevation of 6.3 times normal level was recorded with a DVT diagnosed at DUS.

CONCLUSION

Requests for DUS has increased significantly over the past decade in order to provide diagnostic certainty with consequent significant burden on radiology services. The low positive outcome (10.3%) following DUS, as compared to antiquated international comparisons of 12-25% supports suggestions of a deluge in reliance on this investigation for a negative diagnosis. Average pre-test MWC scores suggested the majority of patients were within 'likely range" for existence of a lower limb DVT, which may suggest a need to reassess interpretation of the MWC

CLINICAL RELEVANCE/APPLICATION

Venous thromboembolism is a common cause of morbidity and a potentially fatal complication of hospitalization. DVT is the most common form of venous thrombosis with an estimated incidence of 67 per 100,000 in the general population and a cumulative lifetime incidence of 2 to 5%. The diagnosis of DVT is initially based on clinical suspicion, clinical examination and the use of the MWC. DUS is only indicated to confirm the diagnosis of a DVT in a patient with a MWC score of two or greater. A D-Dimer test may be utilized as an adjunct to an elevated MWC score to support a diagnosis.

RC308-12 Clinical Utility of CT Pulmonary Angiography in the Emergency Department when Providers Override Evidence-Based Clinical Decision Support

Tuesday, Nov. 29 11:40AM - 11:50AM Room: N230B

Awards
Student Travel Stipend Award

Participants
Zihao Yan, BS, Boston, MA (*Presenter*) Nothing to Disclose
Ali Raja, MD, MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ivan Ip, MD, MPH, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose
Joshua Kosowsky, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jeremiah Schuur, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ramin Khorasani, MD, Boston, MA (*Abstract Co-Author*) Consultant, Medicalis Corp

PURPOSE

Assess frequency of clinically useful diagnoses other than pulmonary embolism (PE) found on CT pulmonary angiography (CTPA) in emergency department (ED) patients with suspected PE when providers' imaging request is inconsistent with evidence-based clinical decision support (CDS).

METHOD AND MATERIALS

This Institutional Review Board-approved study was performed at a tertiary-care, academic medical center ED with approximately 60,000 annual visits. We included all adult patients with suspected PE undergoing CTPA between 1/1/2011-8/31/2013. Each order was exposed to CDS based on the Wells Criteria. We compared the frequency of clinically useful alternative diagnoses (alternative diagnoses/ number of CTPAs) when providers overrode CDS alerts (e.g., CTPAs in patients with Well Score (WS) ≤4 with normal or no–D-dimer) to orders adherent to CDS (CTPAs in patients with WS >4 or WS ≤4 with elevated D-dimer). We defined clinically useful alternative diagnosis as imaging findings other than PE that could potentially explain the patient's signs and symptoms (e.g. shortness of breath) and result in changes in clinical management within 3 months (e.g. thoracentesis 2 days post-CTPA for pleural

effusion not seen on prior X-ray). Incidental findings resulting in changes in clinical management within 3 months (e.g. newly discovered enlarged mediastinal or hilar lymph nodes resulting in oncology admission) were also included. We hypothesized 20% rate of alternative diagnoses in the CDS adherent group, and 35% in the non-adherent group, requiring a sample size of 138 CTPAs in each group to provide 80% power ($\alpha = 0.05$; two-tailed test). After removing positive PE studies in both groups, 150 CTPAs were randomly selected from each group. We performed patient chart review to investigate existence of alternative diagnosis. Chi-squared test was used for statistical analysis.

RESULTS

Among 2993 CTPA studies, 589 studies were performed against CDS recommendations. The frequency of alternative diagnoses in the override group was 32% (48/150), compared to 15% (22/150) in the adherent group ($p< 0.001$).

CONCLUSION

CTPAs performed against the recommendation of evidence-based CDS were more than twice as likely to result in alternative diagnoses.

CLINICAL RELEVANCE/APPLICATION

CTPA use inconsistent with evidence-based CDS may provide clinical utility in nearly 1/3 of patients, prompting further research to determine if alternative tests would be more optimal in such patients.

RC308-13 Cardiac and Hemodynamic Effects of Arterial Obstruction in Cancer-related Acute Pulmonary Embolism

Tuesday, Nov. 29 11:50AM - 12:00PM Room: N230B

Participants
Juana M. Plasencia-Martinez, MD, Murcia, Spain (*Presenter*) Nothing to Disclose
Alberto Carmona-Bayonas, MD, Murcia, Spain (*Abstract Co-Author*) Nothing to Disclose
David Calvo-Temprano, MD, Oviedo, Spain (*Abstract Co-Author*) Nothing to Disclose
Paula Jimenez-Fonseca, MD, Oviedo, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze the impact of acute pulmonary embolism (PE) on right ventricle (RV), and their hemodynamic effects in patients with cancer.

METHOD AND MATERIALS

303 consecutive patients with symptomatic cancer-related PE were ambispectively enrolled in the multicenter (14 hospitals) observational EPIPHANY study. All PEs were diagnosed by computed tomography pulmonary angiography. Arterial obstruction severity was quantified with the Qanadli index (QI). Patients were stratified by PE location as central (trunk, main and/or lobar) or peripheral (segmentary and/or subsegmentary branches). RV-dysfunction signs were defined as dilated RV (≥39 mm), increased right-to-left ventricle (RV/LV) diameter ratio (≥1) and abnormal (flattened or inverted) interventricular septum (IVS).

RESULTS

Mean QI scores were higher in subjects with dilated RVs (30.4±21.7 vs. 23.6±18.5, P=0.007) and abnormal IVSs (39.5±20.7 vs. 22.1±18.2, P<0.001). QI measurements correlated with the RL/LV ratio and RV diameter (r=0.39 and 0.28, respectively, P<0.001). Correlation between QIs and systemic blood pressure (SBP) was weak overall. However, progressively decreased heart adaptive capacity, as expressed by dilated RVs or abnormal IVSs, QI showed an inverse correlation with SBP that increased gradually (r=-0.56, P=0.09; r=-0.998, P<0.001, respectively). Correlations between QI measurements, RV/LV ratios and RV diameters were stronger in hypotensive subjects (r=0.55 and r=0.64, respectively, P<0.001). In subjects with RV-dysfunction, the QI increased from normotensive to hypotensive patients (28.7±21.8 vs. 42.1±17.6, P=0.004). All those effects were unrelated with PE location (central or strictly peripheral).

CONCLUSION

In acute pulmonary embolism, the arterial obstruction index, assessed by Qanadli index, affects the hemodynamic status, but only when the right-sided heart adaptive capacity fails.

CLINICAL RELEVANCE/APPLICATION

The evaluation of right ventricular dilation by CT pulmonary angiography is more useful than the degree of occlusion of the pulmonary vasculature in predicting the outcome of cancer-related pulmonary embolism, likely because it evaluates better the hemodynamic impact of the increased afterload produced by PE on ventricular function, especially in patients with reduced cardiac contractility

RC313

Pediatric Series: CV/Chest

Tuesday, Nov. 29 8:30AM - 12:00PM Room: N228

CA CH VA PD

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.50

FDA Discussions may include off-label uses.

Participants
R. Paul Guillerman, MD, Houston, TX (*Moderator*) Nothing to Disclose
Elizabeth F. Sheybani, MD, Saint Louis, MO (*Moderator*) Nothing to Disclose

Sub-Events

RC313-01 Imaging of Childhood Interstitial Lung Disease

Tuesday, Nov. 29 8:30AM - 8:50AM Room: N228

Participants
Catherine M. Owens, MD, London, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand and define the Childhood Interstitial Lung disease ChILD classification. 2) To illustrate examples within this classification. 3) To update on more recent additions with clinicopathological examples.

ABSTRACT

RC313-02 Radiologic Evaluation of Drug-Induced Pneumonitis following Carmustine (BCNU)-Based Preparative Regimens in Children

Tuesday, Nov. 29 8:50AM - 9:00AM Room: N228

Participants
Yu Jin Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Woo Sun Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Hun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung-Eun Cheon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
In-One Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji-Eun Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Jin Ryu, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To describe radiologic findings of drug-induced pneumonitis following carmustine (BCNU)-based preparative regimens for autologous peripheral blood stem cell transplantation (aPBSCT) in children.

METHOD AND MATERIALS

From 2010 through 2014 in our institution, among 35 patients who received carmustine-based preparative regimens for aPBSCT, 9 patients (6 boys and 3 girls; 3-17 years, mean 10 years; 7 lymphoma and 2 leukemia patients) presented respiratory symptoms and radiologic abnormalities. They had no evidence of infection, cardiogenic edema, and other explainable causes. The chief complaints were fever (n=8, 89%), dyspnea (n=4, 44%), and cough (n=2, 22%). The symptoms developed at 40th day on average (range 34-51 days) after receiving carmustine-based preparative regimens. Chest radiographs and CT scans performed under the impression of infection at the first of respiratory symptoms were reviewed by 2 pediatric radiologists who reached consensus in analyzing the presence and distribution of ground-glass opacity (GGO), consolidation, septal thickening and other various patterns of interstitial pneumonitis, and pleural effusion.

RESULTS

Radiographic findings were bilateral patchy GGO (n=9, 100%) combined with consolidation (n=3, 33%) and septal thickening (n=6, 67%). Pleural effusion were noted in 5 patients (56%). CT findings were patchy GGO (n=9, 100%), localized consolidations (n=4, 44%) and septal thickening (n=7, 78%). The distribution of lesions were bilateral (n=9, 100%) and lower lobar predominant (n=6, 67%). There was no central/peripheral, or anterior/posterior predilection. Pleural effusion was seen in 6 patients (67%) at CT scans and was bilateral in all.

CONCLUSION

Bilateral patchy GGO combined with or without consolidation, septal thickening and bilateral pleural effusion were common radiologic findings in drug-induced pneumonitis following carmustine-based preparative regimens. It should be differentiated from pulmonary infection which is critical and frequently encountered in oncologic patients.

CLINICAL RELEVANCE/APPLICATION

Carmustine can cause pneumonitis. Common radiologic findings of this pneumonitis were bilateral patchy GGO combined with or without consolidation, septal thickening and bilateral pleural effusion.

RC313-03 High-temporal Resolution Chest CT Examinations in Infants and Young Children without Sedation or General Anesthesia: Frequency and Severity of Motion Artifacts

Tuesday, Nov. 29 9:00AM - 9:10AM Room: N228

Participants
Suonita Khung, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Nicolas Lasalle, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Younes Arous, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Antoine Deschildre, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jacques Remy, MD, Mouvaux, France (*Abstract Co-Author*) Research Consultant, Siemens AG
Martine J. Remy-Jardin, MD, PhD, Lille, France (*Abstract Co-Author*) Research Grant, Siemens AG
Antoine Hutt, MD, Lille, France (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the frequency and severity of motion artifacts on chest CT examinations acquired without sedation nor general anesthesia in infants and children younger than 5 years.

METHOD AND MATERIALS

The study population included all consecutively registered infants and young children (age <5 years) who had been referred for a standard chest CT examination on a third-generation, dual-source CT system. The examinations were obtained with a high-pitch and high-temporal resolution protocol (pitch: 3.0; rotation time: 250 ms). Children were scanned while freely breathing, without sedation or general anaesthesia. In order to scan quiet children, each examination was supervised by a paediatric nurse practitioner. For each examination, we recorded (a) the number of acquisitions necessary to reach a diagnostic image quality, (b) the frequency and severity of motion artifacts in the upper, mid and lower lung zones using a 4-point scale (0 : no artifact ; 1 : mild; 2 : moderate ; 3 : severe) and (c) the diagnostic value of each acquisition.

RESULTS

The study population comprised 343 patients (mean age: 14.92 months) who underwent a contrast (n=240) or noncontrast (n=103) chest CT examinations; the mean duration of data acquisition was 0.23 ± 0.05 s (range: 0.11 – 0.52). For 330 patients (96.2%), the investigation comprised a single acquisition which was rated as follows: (a) no motion artifact over the entire thorax (n=193); (b) presence of motion artifacts that did not affect the overall diagnostic value of the examination (n=137) with a mean score of artifact of 0.72 (median: 0.67; range: 0.33 – 2.33). In 13 patients (3.8%): (a) the acquisition was rated as nondiagnostic due to the presence of severe artifacts (mean score: 1.62; range: : 1.67-2.67); (b) a second acquisition was then performed, rated as diagnostic in 13 cases (mean score of artifact: 0.47; median: 0.17; range: 0-2) and nondiagnostic in 1 patient.

CONCLUSION

Diagnostic image quality is obtained with a single examination in 96.2% of children scanned while freely breathing.

CLINICAL RELEVANCE/APPLICATION

High-quality chest CTA can be routinely obtained in freely-breathing infants and young children when evaluated with high-temporal resolution, making sedation and anesthesia unnecessary.

RC313-04 Correlation of High Resolution Computed Tomography Finidngs and Clinical Severity of Bronchopulmonary Dysplasia

Tuesday, Nov. 29 9:10AM - 9:20AM Room: N228

Participants
Min Yeong Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

To analyze high resolution computed tomography (HRCT) finidngs in neonate with bronchopulmonary dysplasia (BPD). To evaluate correlation between HRCT finidngs and clinical severity.

METHOD AND MATERIALS

From 2008 to 2015, fifty very low birth weight infants with BPD underwent HRCT exams at the mean postmenstrual age of 38.7 weeks. HRCT finidngs were classified as two categories and 7 findings: 1) hyperaeration; area of decreased lung attenuation, mosaic attenuation, bulla/bleb and 2) parenchymal lesions; linear lesions, consolidation, bronchial wall thickenig, bronchiectasis. These HRCT finidngs were recorded in each lobe of lungs. Clinical severity was graded as mild, moderate and severe. Each HRCT finidng, sum of hyperaeration scores, sum of parenchymal lesion scores and total scores of HRCT findings were analyzed for correlation with clinical severity of BPD.

RESULTS

The total scores of HRCT findings were significantly correlated with clinical severity of BPD ($r>0.6$, $p=0.03$). Parenchymal lesion scores were well correlated with clinical severity of BPD while hyperaeration scores were not significantly correlated with clinical severity of BPD. The best correlated HRCT finding is consolidation ($p=0.006$). Area of decreased lung attenuation was frequent findings regardless of clinical severity of BPD.

CONCLUSION

Total scores of HRCT finidngs are correlated with clinical severity of BPD and parenchymal lesion scores have a key part, especially consolidation. Unlike previous reports about HRCT of BPD, hyperaeration scores are not correlated with clinical severity of BPD.

CLINICAL RELEVANCE/APPLICATION

On HRCT of infatns with BPD, hyperaeration is not specific for clinical severity of BPD but consolidation is predictive findings of that of BPD.

RC313-05 Assessment of the Severity of Disease in Patients with Cystic Fibrosis using MRI of the Lung: Signal Intensity and Lung Volumes Compared to the Lung-Clearance-Index and Forced Expiratory-Volume-in-1-Second

Tuesday, Nov. 29 9:20AM - 9:30AM Room: N228

Participants
Sabrina Fleischer, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Ilias Tsiflikas, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Verena Langlouis, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Matthias Teufel, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Ute Graepler-Mainka, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Joachim Riethmuller, MD, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Hector, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Juergen F. Schaefer, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose

PURPOSE

Morphological assessment of lung damage is already part of diagnostic work-up in cystic fibrosis (CF). Imaging biomarkers as lung volume (Vol) or signal intensity (SI) can be calculated at baseline and in follow-up. Aim of this study was to correlate MR values of regional pulmonary function with lung clearance index (LCI) and forced expiratory volume in 1 second (FEV1) as the most important parameter for the monitoring the disease.

METHOD AND MATERIALS

IRB waived informed consent and approved this retrospective, HIPAA-compliant study. 49 consecutive CF-patients (23 f, 26 m) mean age 17 +/- 7 y (7-40y) received MRI at 1.5 T of the lung as standard of care in our institution. In this protocol, a 2D GRE sequence with very-short echo time was applied in submaximal inspiration as well as expiration. Semiautomatic segmentation of ventilated areas was performed. Absolute Vol and SI values at in- and expiration, relative differences (Vol_Delta and SI_Delta) and cumulative histograms for relative SI values across entire lung volume were computed.

RESULTS

Strong correlation between Vol_Delta and SI_Delta was found (R=0.86; P<0.0001). Individual Vol-SI-curves created by cumulative histograms allowed visually the differentiation between clinically minimal and strongly affected patients (LCI > 10). The expiratory volume at a relative SI of 100% correlated significantly with LCI and FEV1 (R=0.63 and R=0.81; P<0.0001).

CONCLUSION

A close relation of pulmonary volume and SI during respiration was observed. Individual Vol-SI-curves were suitable to estimate the severity of disease clinically assessed by LCI. The cross correlation with LCI and FEV1 might be promising for the quantification of areas with low SI values due to air trapping.

CLINICAL RELEVANCE/APPLICATION

Cumulative histograms for relative SI values across lung volume by unenhanced MRI offer information of regional ventilation and can estimate the severity of disease in CF.

RC313-06 Characterization of All-Terrain Vehicle-Related Chest Injury Patterns in Children

Tuesday, Nov. 29 9:30AM - 9:40AM Room: N228

Participants
Kelly N. Hagedorn, MD, Houston, TX (*Presenter*) Nothing to Disclose
Jennifer H. Johnston, MD, Cerritos, CA (*Abstract Co-Author*) Nothing to Disclose
Sean K. Johnston, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Nagaramesh Chinapuvvula, MBBS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Chunyan Cai, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate chest injury patterns in pediatric patients involved in all-terrain vehicle (ATV) accidents.

METHOD AND MATERIALS

A retrospective review of the trauma registry at a level I trauma institution from 1992-2013 was performed for patients between 0-18 years admitted after ATV-related incidents. Only patients with chest imaging were included. Type of chest injuries, mechanism of injury, driver/passenger status and demographic data were recorded. Clinical data such as length of hospital stay and intensive care unit (ICU) admission were documented. Comparison of demographic data and clinical data between patients with and without chest injury was conducted using the Chi-square test for categorical variables and two-sample t test for continuous variables.

RESULTS

A total of 455 pediatric patients were admitted after an ATV injury during the study period. Of these, 102 patients (22%) had a chest injury. Most injuries occurred due to a rollover (44/102, 43%), collision with landscape (20/102, 20%) or falls (16/102, 16%). The patient was the driver in 41 (40%) and passenger in 33 (32%) cases (others unknown). Patients with chest injuries were older (13 vs 11 years, P 0.0027), taller (157 cm vs 148 cm, P 0.0012), and heavier (57 kg vs 48 kg, P 0.0006) than those without chest injury. The most common injury was pulmonary contusion (62/102, 61%), followed by pneumothorax (46/102, 45%) and non-flail rib fracture(s) (35/102, 34%). There were no cardiac, esophageal, or airway injuries, and no vascular injury other than a case of subclavian artery transection.Patients with chest injury more often required ICU care (41/102, 40%, compared to 77/353, 22%, P 0.0002) and had longer median hospital stay (3 days vs 2 days, P 0.0054) compared to patients without chest injury. Eight patients with chest injury died (8%).

CONCLUSION

Chest injuries are a relatively common occurrence in children following ATV accidents, which remain a significant public health issue in terms of morbidity and mortality. Patients with chest injuries were more likely to require ICU care and to have a longer hospital

stay.

CLINICAL RELEVANCE/APPLICATION

Chest injuries following ATV accidents in the pediatric population are common and increased public awareness of these potentially devastating injuries is needed.

RC313-07 Does a Normal Chest X-ray Obviate the Need for Thoracic CT Scanning in Pediatric Trauma?

Tuesday, Nov. 29 9:40AM - 9:50AM Room: N228

Participants
Mohammed F. Mohammed, MBBS, Vancouver, BC (*Presenter*) Nothing to Disclose
Reem S. Zakzouk, MD, Riyadh, Saudi Arabia (*Abstract Co-Author*) Nothing to Disclose
Nizar Bhulani, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Hesham M. Alshaalan, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Amna A. Kashgari, MD, Halifax, NS (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Motor vehicle collisions and road traffic related injuries constitute one of the leading causes of premature death worldwide. In children with multiple injuries, the presence of chest trauma increases the mortality rate by 20 times. Whole-body CT has become the mainstay in assessment of patients involved in traumas of various causes. The drawback has been an increase in exposure to medical imaging. Pediatric patients are more sensitive to the negative effects of ionizing radiation, and minimizing exposure is a priority.We assess the role of a negative chest x-ray in obviating the need for further chest CT in stable pediatric patients that have sustained trauma in an attempt to reduce unnecessary imaging.

METHOD AND MATERIALS

A retrospective study was carried out on all patients under 14 years of age that presented to our institution, a level 1 trauma center, from 2010 to 2013. A total of 304 patients received whole-body trauma CT and had received chest x-rays within 30 minutes of the CT. The chest x-rays and thoracic CT scans were independently reviewed by two radiologists who were blinded to the clinical outcome.The presence of pulmonary contusions/consolidations, pneumothorax, pneumomediastinum, subcutaneous emphysema, pleural effusion and fractures was recorded.

RESULTS

165 (54.3%) of the chest x-rays were normal. Of these, 41 (24.8%) demonstrated minimal airspace opacity on CT. These were confined to one lobe and were small. They did not warrant further management in all 41 patient. 2 out of the 41 patients had tiny pneumothoraces on CT which did not require further follow up or intervention.The remaining 139 chest x-rays had at least 1 positive finding and demonstrated good correlation to significant CT findings that required further intervention and management ($p < 0.01$). The likelihood of significant CT findings was greater when pleural effusion was present on the x-ray or when 2 or more findings were positive on the chest x-ray.

CONCLUSION

A normal chest x-ray virtually excludes the presence of significant findings on the thoracic CT scan; however, if the chest x-ray demonstrates any pathology, particularly pleural effusion, a chest CT is required to exclude significant findings which may require immediate intervention.

CLINICAL RELEVANCE/APPLICATION

In a stable, assessable pediatric patient with a low suspicion mechanism of injury, a normal chest x-ray likely obviates the need for further assessment or intervention.

RC313-08 Imaging of Vascular Rings

Tuesday, Nov. 29 9:50AM - 10:10AM Room: N228

Participants
Elizabeth F. Sheybani, MD, Saint Louis, MO, (elizabeth.sheybani@wustl.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the presentation and clinical signficance and developmental anatomy of vascular rings. 2) Identify major findings indicative of vascular rings on mutliple modalities including radiography, fluoroscopy, CT and MRI. 3) Classify vascular rings and identify key features on cross-sectional imaging for surgical planning. 4) Compare available modalities and optimize evaluation of vascular rings.

ABSTRACT

RC313-09 Imaging of Tetralogy of Fallot

Tuesday, Nov. 29 10:30AM - 10:50AM Room: N228

Participants
Taylor Chung, MD, Oakland, CA, (tchung@mail.cho.org) (*Presenter*) Travel support, Koninklijke Philips NV;

Active Handout:Taylor Chung

http://abstract.rsna.org/uploads/2016/16000461/rc31309 RSNA2016_TOF_talk.pdf

LEARNING OBJECTIVES

1) Understand the clinical indications therefore imaging goals for post-operative imaging of patients with tetralogy of Fallot. 2) Review practical clinical MR protocol for post-operative imaging of patients with tetralogy of Fallot.

RC313-10 Assessment of the Reliability of Ventricular Function and Flow Evaluation for Repaired Tetralogy of Fallot with 4D Flow MRI

Tuesday, Nov. 29 10:50AM - 11:00AM Room: N228

Participants
Qiong Yao, MD, Shanghai, China (*Presenter*) Nothing to Disclose
Michael A. Kadoch, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Floris-Jan S. Ridderbos, BSC, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Shreyas S. Vasanawala, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research collaboration, General Electric Company; Consultant, Arterys Inc; Research Grant, Bayer AG;
Frandics P. Chan, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Patients with repaired tetralogy of Fallot (rTOF) require regular monitoring by MRI to assess for right ventricular enlargement and pulmonary regurgitation. 4D flow, a time-resolved, volumetric, accelerated phase contrast technique, may efficiently acquire this information in 10 minutes. We evaluate (1) the consistency between ventricular volumes and flows within 4D flow data and (2) the agreement of these parameters with conventional 2D SSFP-cine and 2D phase contrast acquisitions in patients with rTOF.

METHOD AND MATERIALS

Following IRB approval, patients diagnosed with uncomplicated rTOF who underwent combined 2D and 4D flow MRI studies were identified. Patients with residual shunts, pulmonary conduits, pulmonary stenosis, and/or significant non-pulmonary valvular regurgitation were excluded. Using post-processing software (Arterys for 4D data, Medis for 2D data), pulmonary and systemic flows (Qp, Qs), pulmonary regurgitant volume (PRV), and left/right diastolic/systolic ventricular volumes (LVEDV, RVEDV, LVESV and RVESV) were quantified. From these measurements, stroke volumes (LVSV, RVSV), ejection fractions (LVEF, RVEF), pulmonary regurgitant fraction (PRF), and left/right ventricular outputs (LVO, RVO) were calculated. Internal consistency between Qp and Qs as well as between PRV and RVO-LVO difference was measured using intra-class correlation (ICC). Agreement with 2D data was measured using Pearson correlation and Bland–Altman plot.

RESULTS

24 patients (10 males, 6.4 ± 4.8 years) were identified. For 4D MRI, Qp and Qs had good agreement (ICC 0.446-0.866) as did PRV with RVO-LVO difference (ICC 0.315-0.820). 4D and 2D results were well correlated (r =0.885 for LVEDV, 0.974 for RVEDV, 0.898 for LVESV, 0.980 for RVESV, 0.863 for EFl, 0.925 for EFr, 0.447 for Qp/Qs and 0.764 for PRF). Bland–Altman analysis showed wider limits of agreement for flow relative to ventricular function.

CONCLUSION

Ventricular function and flow measurements can be accomplished with 4D flow MRI and are consistent with 2D results.

CLINICAL RELEVANCE/APPLICATION

Monitoring of patients with uncomplicated rTOF can be achieved in under 10 minutes with an MRI protocol consisting of a single 4D flow sequence, improving patient experience and reducing costs.

RC313-11 A Prospective Evaluation of Contrast and Radiation Dose and Image Quality in Cardiac CT in Children with Complex Congenital Heart Disease using Low-Concentration Iodinated Contrast Agent and Low Tube Voltage and Current

Tuesday, Nov. 29 11:00AM - 11:10AM Room: N228

Participants
Qiaoru Hou, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Li Wei Hu, DIPLENG, MENG, Pudong, China (*Abstract Co-Author*) Nothing to Disclose
Haisheng Qiu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yumin Zhong, MD, Shanghai, China (*Presenter*) Nothing to Disclose

PURPOSE

To assess image quality and contrast and radiation dose in cardiac CT in children with congenital heart disease using low-concentration iodinated contrast agent and low tube voltage and tube current.

METHOD AND MATERIALS

110 consecutive patients(54 male, 56female, 5kg

RESULTS

There was no difference in age, weight between the two groups (all p>0.05). The iodine load in Group A was 30% lower than in Group B (3.98±0.75gI vs.5.76±1.02gI, p<0.001). And CTDIvol, DLP and ED in Group A (1.35mGy, 15.29±1.91mGy/cm and 0.60±0.07mSv) were lower than in Group B(1.81 mGy, 20.11±2.12mGy/cm and 0.77±0.10 mSv) (all p<0.001). However, the mean CT value, noise, CNR and SNR for Group A and Group B were similar (all p>0.05), and the mean image quality score for Group A and Group B was also similar with good agreement between the two observers. Comparing to the surgery results (n=26 in Group A and n=38 in Group B), Group A was 96% accurate in the diagnosis for extracardiac defects and 92% accurate for intracardiac defects, while Group B was 95% accurate in the diagnosis for extracardiac defects and 93% accurate for intracardiac defects.

CONCLUSION

The scanning protocol using low tube voltage (80kVp), low tube current (120mA) and low-concentration iodinated contrast agent (270mgI/mL) enables reduction in iodine load and radiation dose while maintaining compatible image quality.

CLINICAL RELEVANCE/APPLICATION

Low tube voltage (80kVp),low tube current (120mA) and low-concentration iodinated contrast agent (270mgI/mL) may be used

effectively to examine complex congenital heart disease in infants.

RC313-12 Comparison of 3 Different Carotid Artery Intima Media Thickness (IMT) Measurements According to Math's System Software, Non Invasive Vascular Elastography (NIVE) Platform and Radiofrequency (RF) Generated Ultrasound Sequences in a Pediatric COH

Tuesday, Nov. 29 11:10AM - 11:20AM Room: N228

Participants
Ramy El Jalbout, MD, Montreal, QC (*Presenter*) Nothing to Disclose
Guy Cloutier, PhD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Melanie Henderson, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Chantale Lapierre, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Gilles P. Soulez, MD, Montreal, QC (*Abstract Co-Author*) Speaker, Bracco Group Speaker, Siemens AG Research Grant, Siemens AG Research Grant, Bracco Group Research Grant, Cook Group Incorporated Research Grant, Object Research Systems Inc
Josee Dubois, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare IMT measurements in children according to three different techniques: Math’s system software, radiofrequency generated ultrasound sequences and NIVE software.To compare IMT measurements between two groups of normal and overweight/obese children using 3 different techniques

METHOD AND MATERIALS

Children aged between 8 and 10 years (n=120) were randomly chosen such that 60 children were of normal weight (group A) and 60 children were overweight (group B). We compared 3 methods of IMT measurement of the far away common carotid artery wall relative to the transcutaneously placed linear ultrasound probe. The first used a dedicated software Math’s system allowing an automated measurement of IMT on B-mode ultrasound images. The second measured IMT automatically using an echotracking system based on the amplitude of radiofrequency (RF) signal. The third used a semi automated segmentation analysis generated by the NIVE platform of video sequences obtained with radiofrequency ultrasound.

RESULTS

There is no significant correlation between any of the three different techniques neither in group A nor in group B. In group A, the interclass correlation coefficients were as follows: IMT B-mode-IMT RF ICC=0.010 (p=0.28), IMT B-mode-IMT NIVE ICC=0.003 (p=0.45), IMT RF-IMT NIVE ICC=0.0006 (p=0.52). In group B, IMT B-mode-IMT RF ICC=0.003 (p=0.42), IMT B-mode-IMT NIVE ICC=0.005 (p=0.43) and IMT RF-IMT NIVE ICC=0.002 (p=0.42). Each technique has its limitations in the pediatric population. However, when comparing IMT values across weight, IMT was significantly lower for normal weight youth using all 3 techniques: using B-mode (0.553 mm versus 0.573 mm for groups A and B respectively; p=0.026); using RF (0.457 mm for group A vs 0.489 mm for group B; p=0.031 and using NIVE algorithm (0.325 mm vs 0.355 mm for groups A and B; p=0.010).

CONCLUSION

Significant IMT measurement variation was observed between the different techniques. However, overweight children tend to have higher IMT values regardless of the method used. There is no gold standard technique and future studies are needed to validate our results.

CLINICAL RELEVANCE/APPLICATION

Risk factors for atherosclerosis begin in chidhood. IMT using the same technique can be used to target children at risk and follow them in time until one technique proves to be the gold standard.

RC313-13 Utility of 1.5-T Three-dimensional Steady-State Free Precession Whole-heart MRI in the Assessment of Coronary Artery Anatomy with and without Contrast Enhancement in Children

Tuesday, Nov. 29 11:20AM - 11:30AM Room: N228

Participants
Quanli Shen, Shanghai, China (*Presenter*) Nothing to Disclose
Xihong Hu, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Qiong Yao, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the performance of a contrast-enhanced with a noncontrast 1.5-T three-dimensional (3D) steady-state free precession (SSFP) sequence for magnetic resonance coronary angiography (MRCA) in children.

METHOD AND MATERIALS

The study was approved by the institutional review board. Seventy-nine children in the age range of 1 month to 18 years were enrolled in this study. They were classified into three groups according to the age: group 1 = patients 2 years or younger (n = 19), group 2 = patients older than 2 years to 5 years (n = 17), group 3 = patients older than 5 years (n = 43). A free-breathing, navigator-gated, 3D SSFP whole-heart protocol at 1.5-T was used before and after injection of Gadolinium-DTPA. The image quality, vessel length, signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of the left main trunk (LMT), left anterior descending coronary artery (LAD), left circumflex coronary artery (LCX), and right coronary artery (RCA) were assessed by using Wilcoxon signed-rank test.

RESULTS

The application of Gadolinium-DTPA improved the image quality of all the coronary arteries in group 1 (P 0.05). Contrast-enhanced 3D SSFP sequence revealed longer length for LAD and LCX in group 1, and LCX in group 2 (P 0.05). SNR and CNR of all the coronary arteries in group 1 and 2, and the LCX and RCA in group 3 increased after application of Gadolinium-DTPA (P 0.05).

CONCLUSION

Contrast-enhanced 3D SSFP whole-heart MRCA at 1.5-T significantly improves the image performance in young children, but the

Contrast-enhanced 3D SSFP whole-heart MRCA at 1.5 T significantly improves the image performance in young children, but the overall performance is not significantly improved in older children.

CLINICAL RELEVANCE/APPLICATION

3D SSFP whole-heart MRCA can be used young children with congenital heart disease or Kawasaki Disease.

RC313-14 Feasibility of Low Iodine Containing Iodixanol 270 Contrast Media for Cardiac Computed Tomography Angiography Using a Peak Tube Voltage of 80kV in Neonates and Infants

Tuesday, Nov. 29 11:30AM - 11:40AM Room: N228

Participants
Ki Seok Choo, MD, Yangsan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jae-Yeon Hwang, MD, Yangsan-si, Korea, Republic Of (*Abstract Co-Author*) Research Grant, Bayer AG; Research Grant, Guerbet SA
Jin Hyeok Kim, MD, Yangsan-si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yoon Young Choi, MD, Yangsan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hwaseong Ryu, Yangsan-si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Junhee Han, Yangsan-si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jun Woo Lee, MD, Pusan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jeongmin Lee, MD, Yangsancity, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

Contrast media (CM) of different concentrations are widely used for pediatric cardiac computed tomography angiography (CCTA). However, lower concentration < 300 mgI/ml CM is not routinely used in CTA due to concerns of suboptimal enhancement of cardiac structures and smaller vessels. The aim of the present study was to evaluate the feasibility of using iso-osmolar CM containing a low iodine dose for CCTA in neonates and infants.

METHOD AND MATERIALS

The iodixanol 270 group consisted of 79 CT scans and the iopromide 370 group of 62 CT scans in patients less than one old year. Radiation dose, volume of contrast media, and total iodine dose were retrospectively reviewed. Regarding objective measurements, enhancement and image noise of the ascending aorta (AA), main pulmonary artery (MPA), descending aorta (DA), and left ventricle (LV) were analyzed and contrast-to-noise ratios (CNRs) of the AA and LV were calculated. Regarding subjective measurement, a visual analytic scoring system was devised to evaluate degrees of contrast enhancement, image noise, motion artifact, and overall image quality of each image set. Reader performance for correctly differentiating iodixanol 270 and iopromide 370 by visual assessment was evaluated.

RESULTS

No significant intergroup differences were found between radiation doses or volumes of contrast media. However, iodine doses differed in the two groups (2.1 ± 0.94 g in the iodixanol 270 group and 2.94 ± 1.3 g in iopromide 370 group, P< .001). Group objective and subjective measurements were non-significantly different. Overall sensitivity, specificity, positive predictive value, and negative predictive value for correctly differentiating iodixanol 270 and iopromide 370 by visual assessment were 44.3 %, 57.3 %, 57.8 %, and 43.8 %. Overall area under the curve was 0.51.

CONCLUSION

In conclusion, the application of iodixanol 270 was found to be feasible for performing pediatric CCTA at 80 kVp in neonates and infants. Objective measurements of contrast enhancement and subjective image quality assessments were not statistically different in the iodixanol 270 and iopromide 370 groups.

CLINICAL RELEVANCE/APPLICATION

Low-iodine containing contrast media was not inferior to the high-iodine containing contrast media for cardiac CT angiography using 80 kVp in neonates and infants.

RC313-15 Coronary Artery Imaging in Children

Tuesday, Nov. 29 11:40AM - 12:00PM Room: N228

Participants
Lorna Browne, MD, FRCR, Aurora, CO (*Presenter*) Nothing to Disclose

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MSCC32

Case-based Review of Nuclear Medicine: PET/CT Workshop-Chest Cancers (In Conjunction with SNMMI) (An Interactive Session)

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S406A

CH CT NM OI

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

Participants

Janis P. O'Malley, MD, Birmingham, AL, (jomalley@uabmc.edu) (*Moderator*) Nothing to Disclose
Ciaran J. Johnston, MD, Dublin, Ireland, (cjohnston@stjames.ie) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Discuss the strengths and limitations of PET-CT of the chest with reference to staging the common cancers (lung, breast, esophageal).2. Discuss confounding factors in chest PET-CT including non-neoplastic hyper metabolic lesions and conversely tumours that demonstrate little or no FDG avidity.3. Demonstrate the importance of CT correlation, particularly in suspected lung cancer. 4) Describe the role of PET CT in assessing patient response to radiation therapy and chemotherapy, including early assessment and PET influenced treatment strategies.

MSRO35

BOOST: Lung-Science Session with Keynote

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S103CD

CH RO OI

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

Participants
John C. Grecula, MD, Columbus, OH (*Moderator*) Research Grant, Teva Pharmaceutical Industries Ltd Research Grant, Soligenix, Inc
Matthew M. Harkenrider, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

MSRO35-01 Invited Speaker:

Tuesday, Nov. 29 10:30AM - 10:50AM Room: S103CD

Participants
Meng X. Welliver, MD, Columbus, OH (*Presenter*) Nothing to Disclose

MSRO35-04 Dynamic Contrast-Enhanced Perfusion MRI vs Dynamic Contrast-Enhanced Area-Detector CT vs FDG-PET/CT: Capability for Therapeutic Outcome Prediction in NSCLC Patients with Chemoradiotherapy

Tuesday, Nov. 29 11:00AM - 11:10AM Room: S103CD

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PURPOSE

To directly compare the capability for therapeutic outcome prediction between dynamic first-pass CE-perfusion area-detector CT (ADCT) and MRI assessed by same mathematical method and FDG-PET/CT in non-small cell lung cancer (NSCLC) patients treated with chemoradiotherapy.

METHOD AND MATERIALS

43 consecutive Stage IIIB NSCLC patients (25 male, 18 female; mean age 67 year old) underwent PET/CT, dynamic CE-perfusion ADCT and MRI, chemoradiotherapy, and follow-up examination. In each patient, therapeutic outcomes were assessed as therapeutic effect based on RECIST guideline, disease free interval and overall survival. Then, all patients were divided into two groups as follows: 1) CR+PR (n=23) and 2) SD+PD (n=20) groups. In each patient, total tumor perfusion (TP) and tumor perfusions from pulmonary (TPP) and systemic (TPS) circulations calculated by dual-input maximum slope method from dynamic ADCT and MRI data and SUVmax on PET/CT were assessed at each targeted lesion, and averaged to determine final values. To compare the capability for distinguishing two groups, ROC analyses were performed. Then, disease free and overall survivals between responders and non-responders assessed by each index were compared by Kaplan-Meier method followed by log-rank test.

RESULTS

Area under the curves (Azs) of TP (MRI: Az=0.90, ADCT: Az=0.87) and TPS (MRI: Az=0.84, ADCT: Az=0.84) were significantly larger than that of TPP (MRI: Az=0.72, $p<0.05$; ADCT: Az=0.72, $p<0.05$). Disease free survivals of responder were significantly longer than that of non-responder by TP (MRI: p=0.01, ADCT: p=0.03) and TPS (MRI: p=0.01, ADCT: p=0.001). Overall survivals of responder were also significantly longer than that of non-responder by TP (MRI: p=0.007, ADCT: p=0.004), TPS (MRI: p=0.001; ADCT: p=0.0001) and SUVmax (p=0.04).

CONCLUSION

Dynamic first-pass CE-perfusion ADCT and MRI has equal to or better potential to predict therapeutic outcome than PET/CT in NSCLC patients treated with chemoradiotherapy. Perfusion parameters from dynamic first-pass CE-perfusion ADCT and MRI may be applicable as new biomarkers in this setting.

CLINICAL RELEVANCE/APPLICATION

Dynamic first-pass CE-perfusion ADCT and MRI has equal to or better potential to predict therapeutic outcome than PET/CT in NSCLC patients treated with chemoradiotherapy. Perfusion parameters may be applicable as new biomarkers in this setting.

MSRO35-07 Biological Effective Dose (BED) Influence on Clinical Outcomes of Stage I Non-Small Cell Lung Cancer (NSCLC) Treated with Fiducial-based Robotic Stereotactic Body Radiation Therapy (SBRT) with Respiratory Motion Tracking

Tuesday, Nov. 29 11:30AM - 11:40AM Room: S103CD

Awards
Student Travel Stipend Award

Participants
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ABSTRACT

Purpose/Objective(s): SBRT for early stage NSCLC is an established treatment option for medically inoperable patients. Previous research has supported a biological effective dose (BED) threshold to achieve superior control rates. Fiducial-based robotic SBRT allows for intrafractional respiratory motion management, which avoids the requirement to create an internal target volume (ITV). We report the long-term outcomes of patients treated using this novel unique technique, in particular whether this respiratory motion management strategy is also subject to a reported BED threshold. Materials/Methods: In this single institutional retrospective series we reviewed clinical outcomes of stage I inoperable NSCLC. Inclusion criteria was as follows: (1) AJCC 7thedition stage I tumors, (2) pathologic confirmation of malignancy, (3) pre-treatment PET/CT for mediastinal staging, and (4) medical inoperability determined by multidisciplinary evaluation. All patients were treated using a robotic fiducial-based SBRT system with respiratory motion tracking in 3 or 5 fraction of 10 to 20 Gy to a minimum BED of 100 Gy using a NSCLC tumor a/ß of 10. Locoregional failure was defined as recurrence within the locally treated field, involved lobe, or ispilateral nodal region (N1-2). Local control, locoregional control, and overall survival were calculated using the Kaplan-Meier method and comparisons between BED above and below 105 Gy were calculated using the generalized Wilcoxon test.Results: Sixty-one patients with a median age of 75 years were included. The majority of patients determined to be surgically inoperable due to pulmonary dysfunction. The majority of patients (75%) were diagnosed with AJCC prognostic stage IA NSCLC. Patients were treated using robotic SBRT to a median total dose of 50 Gy with a median BED of 112.5 Gy (range, 100 to 180 Gy). Thirty-one patients were treated with a BED greater than 105 Gy and the remaining 30 with a BED below 105 Gy. Five year local control, locoregional control, and overall survival for those patients treated above and below a BED of 105 Gy were 90.5% vs. 82.6% (p = 0.26), 78.6% vs. 64.8% (p = 0.03), and 38.7% vs. 42.9% (p = 0.97). Conclusion: Statistically significant improvements in locoregional control were observed in patients treated with a BED greater than 105 Gy, although this did not translate into an improvement in overall survival. Treatment of stage I NSCLC with fiducial-based robotic SBRT using advanced respiratory motion management does not preclude the necessity of delivering an adequate BED to the tumor target.

MSRO35-08 Effect of Tumor Contouring on the Prediction Performance of Using Radiomic Approach to Predict Gene Mutational Status in Non-Small Lung Cancer Patients With Gefitinib Treatment

Tuesday, Nov. 29 11:40AM - 11:50AM Room: S103CD

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PURPOSE

Radiomic delta-features describe the change of tumor imaging phenotype between baseline and follow-up scan images. Prior to computation of radiomic delta-features, tumor regions-of-interest (ROI) on baseline and follow-up images need to be delineated by radiologist. This study was to explore the effect of different tumor ROIs drawn by different radiologists on the performance of using radiomic delta-features to predict the epidermal growth factor receptor (EGFR) gene mutational status in non–small cell lung cancers (NSCLC) patient with gefitinib treatment.

METHOD AND MATERIALS

This was a retrospective analysis on a clinical trial data of 46 early stage NSCLC patients with a total of 46 tumors (one tumor per patient) whose EGFR mutation status were known (EGFR+:EGFR-=20:26). All of the patients had non-contrast enhanced, 1.25mm and lung reconstruction images at both CT scan time points. Three radiologists, with reading experiences of 23, 15 and 8 years respectively, used an identical in-house algorithm to independently delineate baseline and three-week follow-up tumor ROIs, upon which 89 radiomic features to describe the change of tumor size, intensity histogram, shape, edge and texture were extracted. Delta-features were the differences between baseline and follow-up features. The area
under the curve (AUC) of the receiver operator characteristic (ROC) was calculated to assess the power of radiomic delta-features on predicting the EGFR mutational status of patients.

RESULTS

Tumor ROIs delineated by different radiologists resulted in different performance on the prediction of the EGFR mutational status. The highest AUCs (number of significant features: AUC >0.8) of the three radiologists' were 0.91 (3), 0.85 (5), and 0.79 (0), respectively. A same feature can have different prediction power if calculated from different tumor ROIs. For example, the AUCs of feature Run_PLU (Run-Length Primitive Length Uniformity) were 0.88, 0.75 and 0.73 for three different ROIs.

CONCLUSION

Radiomic delta-features are able to be used as potential imaging biomarkers to predict the gene mutational status of patient. However, tumor delineation induced differences in predicting EGFR mutations warrants further investigation.

CLINICAL RELEVANCE/APPLICATION

With the rapid growth of the field of radiogenomics, our findings are valuable because they increase awareness of variations in the performance of predicting EGFR mutations using radiomic features.

MSRO35-09 Multiparametric Imaging of the Tumor Response in Non-small Cell Lung Cancer to Stereotactic Ablative Radiation Therapy

Tuesday, Nov. 29 11:50AM - 12:00PM Room: S103CD

Participants
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Ting-Yim Lee, MSc, PhD, London, ON (*Abstract Co-Author*) License agreement, General Electric Company

PURPOSE

To determine whether metabolism as measured with dynamic fluorine-18 fluorodeoxyglucose (FDG) positron emission tomography (PET) and perfusion as measured with dynamic contrast-material enhanced (DCE) computed tomography (CT) scanning can help predicting and assessing the integration and true pathological rate of stereotactic ablative radiation therapy (SABR) in non-small cell lung cancer (NSCLC).

METHOD AND MATERIALS

After Research Ethics Board approval was obtained, 13 patients who have histologically confirmed early stage T1 or T2a NSCLC that has a tumour diameter ≤ 5 cm and no nodal metastases (T1T2N0) underwent dynamic FDG-PET and DCE-CT pre- and post-SABR since September 2014. The post scans were acquired 8 weeks after SABR. Dynamic FDG-PET measures maximum standardized uptake values (SUVmax) in the tumour. DCE-CT imaging allows quantitative mapping of blood flow (BF) and blood volume (BV) in the tumours. Since free-breathing was allowed during DCE-CT scanning, breathing motion was minimized by non-rigid image registration before the BF and BV functional maps were generated. Lobectomy surgery was performed 10 weeks after SABR, to allow sufficient time for reactive response to SABR to subside.

RESULTS

Analysis of dynamic FDG-PET and DCE-CT scans of the first 10 patients showed difference from pre- to post-SABR. Following SABR, there were a reduction in BF (41.3%, P = 0.001), BV (27.8%, P = 0.062) and SUVmax (46.0%, P = 0.005). The included 3D scatter plot shows the distinct characteristic response of NSCLC to SABR.

CONCLUSION

Dynamic FDG-PET and DCE-CT can assess and measure the response of NSCLC to SABR. In future analysis, sensitivity and specificity of this imaging technique and quantitative measurements of glucose kinetics can be calculated.

CLINICAL RELEVANCE/APPLICATION

Novel combination of neoadjuvant SABR plus surgery is being evaluated as a cure for T1T2N0 NSCLC. Dynamic FDG-PET and DCE-CT are a useful adjunct to standard follow-up in assessing true response rate.

SSG03

Chest (Diffuse Lung Disease)

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S404CD

CH CT

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

Participants
Jonathan D. Dodd, MD, Dublin 4, Ireland (*Moderator*) Nothing to Disclose
Brett M. Elicker, MD, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSG03-01 Transitional Changes in Interstitial Lung Disease Using HRCT to Assess the Impact of Treatment with Cyclophosphamide or Mycophenolate: Results of Scleroderma Lung Study II

Tuesday, Nov. 29 10:30AM - 10:40AM Room: S404CD

Participants
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PURPOSE

Systemic sclerosis (scleroderma, SSc) is a complex life-threatening autoimmune disease that affects multiple organ systems. Lung involvement is the leading cause of morbidity and mortality. The aim is to quantify the changes for monitoring the progression or improvement in interstitial lung disease (ILD) over time using voxel-by-voxel transitional scores.

METHOD AND MATERIALS

We report transitional scores using volumetric HRCT scans obtained from participants in SLSII who received either cyclophosphamide (CYC) (n=47) or mycophenolate mofetil (MMF)(n=50). The steps in this process include (1) lobar segmentation and classification of ILD patterns of quantitative lung fibrosis (QLF), quantitative ground glass (QGG), quantitative honeycomb (QHC), and quantitative normal lung (QNL); (2) registration of lobes between two paired scans; (3) mapping each voxel (<27mm3) using a nearest neighbor algorithm; (4) summarizing the transitional patterns into a ratio, where the ratio expresses the counts of changes from one pattern to the other to the counts of patterns at baseline; (5) integrating the transitional net-improvement into a matrix across all patterns. Mixed effect models were used to compare the differences.

RESULTS

Means of the differences in the transitional proportions in the most severe lobe were as follows: CYC group 16% from fibrotic reticulation to GG, 21% from reticulation to normal pattern, and 31% from GG to normal pattern; MMF group 12%, 17%, and 28%, respectively. Similar means were found in whole lung. Mean transitional net improvement from GG or fibrotic pattern to normal patterns and from fibrotic pattern to GG were significant in the two arms (all $p<0.001$).

CONCLUSION

Using voxel-by-voxel transitional scores on paired HRCT scans 24 months apart, we found obvious changes in extent of ILD patterns, indicating significant transitions from ground glass opacity or fibrotic reticulation to normal patterns and regionally dependent changes between fibrotic patterns and ground glass opacity in patients with SSc-ILD treated with either CYC or MMF. These findings demonstrate the utility of serial HRCT scans and quantitative technique in monitoring the response to treatment in SSc-ILD, and provide insights into the nature of the therapeutic effects

CLINICAL RELEVANCE/APPLICATION

Registration-based transitional texture-based CT scores are effective in characterizing structural changes to therapy at each neighboring voxel level.

SSG03-02 Rheumatoid Arthritis Related Interstitial Lung Disease: Identification of Patients with an Idiopathic Pulmonary Fibrosis Equivalent Outcome using Automated CT Analysis

Tuesday, Nov. 29 10:40AM - 10:50AM Room: S404CD

Participants
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PURPOSE

Patients with rheumatoid arthritis-interstitial lung disease (RA-ILD) with a usual interstitial pneumonia pattern on histopathology are thought to have a disease outcome similar to IPF. Our study evaluated CTs using visual and computer analysis to identify CT variables that predicted an IPF-like outcome in RA-ILD.

METHOD AND MATERIALS

Consecutive patients with a rheumatological and multi-disciplinary team diagnosis of RA-ILD (n=50) were included. Visual and computer-based (using CALIPER software) parenchymal features evaluated against mortality included: total ILD extent, honeycombing, reticular pattern, ground glass opacities, pulmonary vessel volume (PVV), emphysema, traction bronchiectasis and consolidation. Pulmonary function tests recorded were FEV1, FVC, DLco, Kco and a composite physiologic index (CPI). Variables predictive of survival were evaluated against mean survival in a study group of consecutive patients with IPF (n=186).

RESULTS

Visual and computer-based measures of pulmonary fibrosis, DLco, Kco and CPI were predictive of mortality on univariate analysis. Independent predictors of mortality in RA included: age (HR=1.07;p=0.007), visual honeycombing presence (HR=5.19;p=0.04), Kco (HR=0.97;p=0.02) and CALIPER PVV (HR=1.61;p=0.0003). Following exclusion of patients with end-stage disease (n=5), patients with RA-ILD (n=45) were evaluated alongside IPF patients using Kaplan Meier and Cox mortality analysis. Binary CT thresholds identifying RA-ILD patients with either good or IPF-like outcomes included:VISUAL: honeycombing presence (n=30); traction bronchiectasis >5/18 (n=27); fibrosis extent >20% (n=32).CALIPER: honeycombing >0.25% (n=22); PVV >3.5% (n=26); fibrosis extent >2% (n=35).Stratification into more detailed prognostic groups was possible with visual fibrosis extent:<20%, 20-35%, >35% and PVV thresholds:<2.5%, 2.5-5.5%, >5.5%.

CONCLUSION

Automated computer-analysis of CTs can predict an IPF-like outcome in RA patients with a similar sensitivity to visual analysis and is not constrained by observer variation.

CLINICAL RELEVANCE/APPLICATION

Automated computer CT analysis can be used to stratify patients with RA-interstitial lung disease in proposed upcoming large-scale multicentre studies. The technique is fast, sensitive and identifies a new CT variable with no visual correlate, thereby obviating the need for arduous visual CT analysis with its associated interobsever variation.

SSG03-03 Functional Differences of Cystic Lesions between IPF and Distal Acinar Emphysema on Relative Regional Air Volume Change Map

Tuesday, Nov. 29 10:50AM - 11:00AM Room: S404CD

Participants
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PURPOSE

Honeycombing cyst is a hallmark of idiopathic pulmonary fibrosis (IPF), but differentiation of paraseptal cysts on CT scans alone is at times difficult. The purpose of this study was to investigate if identification of functional differences between honeycombing cysts and paraseptal low attenuation areas (LAAs) is possible using a relative regional air volume change (RRAVC) map.

METHOD AND MATERIALS

10 normal, 19 emphysema, and 20 idiopathic interstitial lung disease (11 IPF and 9 NSIP) were included in our study. VIDA Apollo software (Coralville, IA) and mass preserving image registration technique were used to compute low ventilation area (LVA) from inspiration and expiration CT scans. LVA0.8 is defined as percent lung volume reflecting less ventilation than 80% of the whole lung mean value. LVA0.8 in the whole lung and fractional air volume change in upper and lower lobes were compared between the three groups using analysis of variance test (ANOVA). The honeycombing cysts in IPF and LAAs in emphysema were visually inspected on the RRAVC map.

RESULTS

LVA0.8 was higher in emphysema patients than IPF or normal subjects (p=0.001). (emphysema: 29.1+/-5.1%, IPF: 19.3+/-5.8%, normal: 20.6+/-5.7) in both lungs. There were significant differences between ILD and emphysema patients in both upper and lower lobe fractional air volume change, where emphysema patients had significantly higher fractional air volume change than normal patients in the upper lobe and ILD patients had lower fractional air volume change than normal patients in the lower lobe. In the RRAVC map, distal acinar emphysema cysts showed decreased air volume change between inspiration and expiration, which represents regional obstruction, characteristic of COPD. Whereas relatively higher ventilation was noted in honeycombing cysts compared to emphysema, suggesting a relatively preserved airway flow in IPF patients.

CONCLUSION

LAAs in distal acinar emphysema were demonstrated as low ventilation areas while cysts in honeycombing did not demonstrate a decreased ventilation on the RRAVC map. This could provide a method for differentiating between distal acinar emphysema and honeycombing cysts.

CLINICAL RELEVANCE/APPLICATION

Cystic lesions which can be seen in IPF and emphysema could be differentiated by the quantitation of acinar scale functional impairment assessed by image matching method, using pairs of inspiratory/expiratory CT data sets.

SSG03-04 Pleuroparenchymal Fibroelastosis (PPFE) Predicts Survival in Idiopathic Pulmonary Fibrosis (IPF)

Tuesday, Nov. 29 11:00AM - 11:10AM Room: S404CD

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PURPOSE

Pleuroparenchymal fibroelastosis (PPFE) is a rare interstitial lung disease (ILD) entity characterized by pleural and parenchymal fibrosis with a striking upper-lobe predominance. PPFE can occasionally coexist with other ILDs. The aim of this retrospective study was to estimate the prevalence and prognostic significance of PPFE in a large group of IPF patients.

METHOD AND MATERIALS

CT imaging from 285 consecutive IPF patients were reviewed (mean age:66±1.1, males:77%, ever smokers:66%, mean FVC:68.4%±2.5, mean DLco:36.3%±1.6, mean CT ILD extent:38.4%±1.6). The presence of PPFE on CT was assessed by two thoracic radiologists and average CT disease extent was used as a measure of disease severity. Mortality, time to irreversible decline in FVC levels of >10% and DLco levels of >15% from baseline, were quantified using proportional hazards analysis.

RESULTS

Kappa values for interobserver agreement for the identification of PPFE were excellent at 0.78. 94 (33%) IPF patients met CT criteria for PPFE. Compared to patients without PPFE, subjects with PPFE were less likely to be ever smokers (p=0.02), had lower FVC measurements (p=0.0005) and more extensive ILD on CT (p=0.03). Freestanding bronchiectasis was identified in 34% of PPFE cases versus < 2% of patients without PPFE (p<0.0001).PPFE was significantly associated with increased mortality (HR:1.54; CI:1.16-2.05, p=0.003), decreased time to decline in FVC (HR:1.82; CI:1.28-2.6, p=0.001) and DLco (HR:2.29 CI:1.6-3.3, p<0.0001). After adjusting for age, gender, smoking status and ILD severity, the association of PPFE with survival and FVC and DLco decline was confirmed.

CONCLUSION

PPFE is an independent predictor of survival and functional worsening in IPF and demonstrates good interobserver agreement. Studies evaluating prevalence and outcome in other diffuse fibrosing lung diseases are needed.

CLINICAL RELEVANCE/APPLICATION

The presence of PPFE in patients with IPF is important to recognize given its independent links with reduced survival.

SSG03-05 Quantitative Follow-Up of Interstitial Pneumonia Using 3D-Curved High-Resolution CT Imaging Parallel to the Chest Wall

Tuesday, Nov. 29 11:10AM - 11:20AM Room: S404CD

Participants
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Shingo Iwano, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

The imaging findings of patients with interstitial pneumonia (IP) were quantified and compared using three-dimensional curved high-resolution computed tomography (3D-cHRCT) at a depth of 1 cm from the chest wall and pulmonary function testing (PFT), including the predicted percent vital capacity (%VC), forced expiratory volume in 1 second (FEV1), and the predicted percent diffusing capacity of the lungs for carbon monoxide (%DLco).

METHOD AND MATERIALS

We retrospectively reviewed patients with IP who underwent multi-detector row CT (MDCT) scanning and PFT at least twice. Thirty-one patients with IP (25 males and 6 females; mean age, 65 years) were enrolled. Based on MDCT data, 3D-cHRCT images of the lung at a depth of 1 cm from the chest wall were automatically reconstructed using original software. The total area (TA), high-attenuation area (HAA) >-500 HU, and %HAA = (HAA/TA) × 100 were calculated. Moreover, the %HAA ratio (current %HAA / past %HAA) was calculated.

RESULTS

Clinically, 12 patients had stable IP and 19 patients had progressive IP. The mean %HAA of all patients was increased from 8.34% to 9.83% during follow-up, and the mean %DLco was decreased from 77.9% to 73.3%. The mean %HAA ratio was significantly lower in the stable IP group than the progressive IP group (1.05±0.28% vs. 1.43±0.40%, p<0.01). Patients with progressive IP had

a significantly greater decrease in %DLco during follow-up than stable IP patients. The mean %HAA ratio of patients with a > 10% decrease in %DLco was significantly higher than other patients (1.52 vs. 1.10, p = 0.030).

CONCLUSION

The %HAA ratio, as determined by 3D curved HRCT in parallel with chest wall data, was significantly correlated with the clinical IP course, and is a novel quantitative parameter by which a decrease in diffusion capacity can be evaluated.

CLINICAL RELEVANCE/APPLICATION

An increase in the %HAA ratio by computed 3D curved HRCT based on routine follow-up HRCT data indicates progressive IP and a lower diffusion capacity

SSG03-06 Evaluation of the Association of Emphysema with Pulmonary Hypertension and Effects on Mortality in Idiopathic Pulmonary Fibrosis

Tuesday, Nov. 29 11:20AM - 11:30AM Room: S404CD

Participants
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PURPOSE

There is conflicting evidence regarding the impact on mortality when emphysema coexists in patients with IPF. We investigated effects on outcome resulting from emphysema in a large IPF cohort, using visual and computer-based (CALIPER) CT analysis.

METHOD AND MATERIALS

Consecutive patients with a multi-disciplinary team diagnosis of IPF (n=272) had CT extents of interstitial lung disease (ILD) and emphysema scored visually on a lobar basis and volumetrically by CALIPER. CT scores were evaluated against functional indices (FVC, DLco, Kco and a composite physiologic index [CPI]), to determine the independent effects of ILD and emphysema extent on functional indices. Logistic regression identified variables predictive of the presence of pulmonary hypertension as measured by echocardiography. Finally, the independent effects of emphysema and ILD extent on mortality were investigated.

RESULTS

IPF patients with emphysema (114/272 [42%]) had significantly less ILD than patients without emphysema (p=0.004). After correction for DLco, age and gender, the presence/extent of emphysema scored visually and by CALIPER had no impact on the presence of pulmonary hypertension (Table 1). Findings were maintained at emphysema thresholds of >5% and >10% of the lung. On Cox mortality analysis, when correcting for baseline disease severity with DLco, patients with and without emphysema had the same outcome with results maintained at emphysema thresholds of >5% and >10% of the lung.

CONCLUSION

The presence and/or extent of emphysema does not influence the likelihood of having pulmonary hypertension. When correcting for baseline disease severity, the presence/extent of emphysema is not linked to a worsened outcome in IPF.

CLINICAL RELEVANCE/APPLICATION

Using both visual and computer scoring of emphysema on CTs: IPF patients with emphysema were shown not to constitute a disease subgroup with a worsened outcome and as such do not require targeted interventions

SSG03-07 Evaluation of the Impact of Emphysema when using FVC Change to Predict Mortality in Patients with Idiopathic Pulmonary Fibrosis

Tuesday, Nov. 29 11:30AM - 11:40AM Room: S404CD

Participants
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PURPOSE

FVC change represents the cardinal variable used to identify clinical deterioration in patients with IPF. However evidence now suggests that emphysema, by preserving lung volumes, may curtail the magnitude of FVC decline in IPF patients undergoing real function deterioration. Our study aimed to evaluate the ability of FVC change to predict mortality in IPF patients with and without emphysema.

METHOD AND MATERIALS

Consecutive patients with a multi-disciplinary team diagnosis of IPF (n=148) with serial FVC, DLco and composite physiologic index (CPI) measurements at 9-18 month intervals had emphysema scored on baseline CTs by two experienced thoracic radiologists. Baseline demographics between groups were analysed using the T-test. Mortality prediction was evaluated using Cox regression analysis.

RESULTS

Significant differences were identified between patients with and without emphysema in baseline FVC, CPI and relative FVC change, but not DLco values (Table 1).With correction for baseline disease severity with the CPI, FVC change was strongly predictive of mortality in patients without emphysema (n=74), but not patients with emphysema (n=65)[Table 2]. DLco and CPI change were predictive of mortality in both groups (Table 2).Based on average relative FVC change values in the two groups, it was calculated that a 10% relative FVC decline in patients without emphysema equated to a 4% relative FVC decline in patients with emphysema. In our cohort, a 4% relative FVC decline threshold identified 5/67 (7%) more patients with a significant functional decline.

CONCLUSION

The presence of emphysema negatively impacts the ability of FVC change to predict mortality in IPF.

CLINICAL RELEVANCE/APPLICATION

When relying on FVC change to identify a clinical deterioration in IPF, patients with emphysema on CT are likely to have disease progression under-recognised and therefore may be undertreated when compared to patients without emphysema

SSG03-08 Serial CT in Cryptogenic Organizing Pneumonia: Evolutional Findings and Prognostic Factors

Tuesday, Nov. 29 11:40AM - 11:50AM Room: S404CD

Participants
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PURPOSE

Most patients with COP have some remaining lesions on CT, simulating a fibrotic nonspecific interstitial pneumonia(fNSIP) pattern, although generally favorable prognosis. However, we do not know what clinical or imaging features are determinant for the remaining disease. The purpose of this study was to observe serial CT features of COP and to investigate prognostic determinants for the remaining disease.

METHOD AND MATERIALS

52 patients with pathologically confirmed COP were studied(20 men and 32 women; mean age,55.3 years; median follow-up period,22 months; range,1-155 months). Clinical findings and pulmonary function test(PFT) results at the time of pathologic diagnosis were assessed. The presence, extent, and distribution of CT findings were reviewed. Overall changes in disease extent were classified as cured, improved(i.e.,≥10% decrease in extent), not changed, or progressed(i.e.,≥10% increase in extent). Uni- and multivariate analyses were performed to seek for prognostic factors among clinical or imaging features.

RESULTS

The most common patterns of lung abnormality on initial CT were GGO(100.0%) and consolidation(70.2%), which were distributed along the bronchovascular bundles(41.4%) or subpleural lungs(27.9%). In 13.5% of patients, the disease disappeared completely; in 63.5%, the disease decreased in extent; in 9.6%, the extent did not change; and in 13.4%, the disease increased in extent. When lesions remained, the most common patterns of follow-up CT were GGO(81.7%) and reticulation(43.3%), which seemed to be like patterns of fNSIP. The prognostic factors related to residual lesions on final CT were the PFT findings(FEV1, FVC and DLco) at the presentation and the patient's age at the diagnosis on univariate analysis($p<.05$). The extent of consolidation on initial CT differed between the patient with complete resolution and remaining lung lesion, but statistically not significant($p=.08$).

CONCLUSION

In 86.5% of COP patients, the lung abnormalities are remaining on follow-up CT with corticosteroid treatment. The most common patterns of residual disease are GGO and reticulation, thus simulated fNSIP pattern on the final follow-up CT. The results of initial PFT and patient's age are related to the presence of residual lung lesions.

CLINICAL RELEVANCE/APPLICATION

Higher initial FEV1, FVC and DLco levels and younger age at presentation in patient of COP may allow the prediction of complete resolution of lung parenchymal lesion on follow-up CT.

SSG03-09 Computer Based Quantitative CT Analysis of Hypersensitivity Pneumonitis Patients: Predicting Outcome Using Advanced Stratification Techniques

Tuesday, Nov. 29 11:50AM - 12:00PM Room: S404CD

Participants
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David M. Hansell, MD, London, England, United Kingdom (*Abstract Co-Author*) Research Consultant, AstraZeneca PLC Research Consultant, Boehringer Ingelheim GmbH Research Consultant, InterMune, Inc Research Consultant, F. Hoffmann-La Roche Ltd

PURPOSE

Computer algorithms quantifying interstitial lung disease (ILD) patterns on volumetric CT acquisitions (such as CALIPER) have dramatically increased in sophistication in recent years. However, application of computer tools to the evaluation of interspaced CTs, (still relevant in young adults and select regional centres), has not been evaluated. Our study assessed the ability of CALIPER to predict mortality in chronic hypersensitivity pneumonitis (CHP) patients undergoing interspaced CTs, and independently analysed the cohort using advanced stratification techniques.

METHOD AND MATERIALS

Interspaced CTs in 98 CHP patients had parenchymal pattern extents evaluated by CALIPER and on a lobar basis by two experienced radiologists. Mortality prediction was calculated using Cox analyses. Independent stratification of the cohort was performed using pairwise comparisons of a dissimilarity metric which identified similar clusters using affinity propagation and analysis of similarities.

RESULTS

Indicators of fibrosis: (VISUAL: honeycombing, traction bronchiectasis) and CALIPER (ILD extent, ground glass opacity, reticular pattern, pulmonary vessel volume) and all pulmonary function tests (PFTs) were strongly predictive of mortality on univariate analysis ($p<0.01$). On multivariate analysis, DLco ($p<0.0001$) and CALIPER reticular pattern ($p=0.001$) were independently predictive of mortality.Stratification identified 3 clusters of patients (illustrated in three dimensional space, with differing outcomes on Kaplan Meier survival curves (Log rank test $p<0.0001$) which correlated well with PFTs.

CONCLUSION

Quantitative tools designed for volumetric CT evaluation have a role in the evaluation of interspaced CTs. Stratification can identify population subgroups with differing outcome. Both findings may have relevance to the use of quantitative CT in drug trials.

CLINICAL RELEVANCE/APPLICATION

Automated stratification when allied to computer based CT analysis allows standardized and objective evaluation of disease burden and mortality prediction. Both techniques could influence patient selection and outcome measures in clinical trials.

CHS-TUA

Chest Tuesday Poster Discussions

Tuesday, Nov. 29 12:15PM - 12:45PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Sushilkumar K. Sonavane, MD, Birmingham, AL (*Moderator*) Nothing to Disclose

Sub-Events

CH255-SD-TUA1 Quantitative CT Texture Analysis for Predicting Recurrence in Lung Adenocarcinoma with a Solid Component Larger than 5 mm

Station #1

Participants
Motohiko Yamazaki, MD, Niigata, Japan (*Presenter*) Nothing to Disclose
Takuya Yagi, Niigata City, Niigata Prefecture, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Ishikawa, MD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose
Hidefumi Aoyama, MD, PhD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Lung adenocarcinoma with a pathological invasive focus ≤5 mm shows excellent prognoses, whereas an invasive focus >5 mm has shown to increase the possibility of recurrence. This study aimed to evaluate the utility of quantitative CT texture analysis for predicting the recurrence of adenocarcinoma exhibiting a solid component >5 mm on thin-section CT.

METHOD AND MATERIALS

This retrospective study consisted of 149 consecutive patients with 149 surgically resected stage I adenocarcinomas with the largest diameter of ≤3 cm and a solid component on the mediastinal window settings of >5 mm on preoperative CT examination. Tumor segmentation was manually carried out on each axial section with a thickness of 1 or 1.25 mm. Subsequently, CT histogram features (kurtosis, skewness, entropy, and 10th to 90th percentile CT values) and quantitative morphologic features (whole tumor volume, mass, surface area, circularity, and sphericity) were computed using an image analysis software. Univariate and multivariate Cox regression analysis were performed to determine the factors associated with recurrence-free survival (RFS), defined as the time from surgery to recurrence. Survival curves were compared using the Log-rank test.

RESULTS

During the follow-up period, 21 patients showed a recurrence of adenocarcinoma. In the univariate analysis, the recurrence rate was significantly higher in patients with lower entropy ($P = 0.02$), higher 50th/75th/90th percentile CT values ($P = 0.014–0.027$), higher circularity ($P < 0.01$), and higher sphericity ($P = 0.011$). There was a trend towards increased recurrence rate in patients with lower skewness ($P = 0.053$) and higher 25th percentile CT values ($P = 0.05$). Multivariate analysis revealed that 75th percentile CT values (hazard ratio, 1.04; $P = 0.03$) and circularity (hazard ratio, 1.76; $P = 0.024$) remained significant factors. Patients with greater than average values for 75th percentile CT values (>–107 Hounsfield units) and circularity (>0.68) had significantly lower 5-year RFS rate compared with the other patients (69.5% vs. 92.0%; $P < 0.01$).

CONCLUSION

Quantitative CT texture parameters have a potential for predicting recurrence of lung adenocarcinoma with a solid component >5 mm.

CLINICAL RELEVANCE/APPLICATION

Quantitative CT texture analysis is a more objective method than visual evaluation and may provide more accurate prognostic information for lung adenocarcinoma patients.

CH256-SD-TUA2 Improving the Patient Experience by Reducing Overnight Interruptions Related to the Performance of Portable Chest X-rays

Station #2

Participants
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Irena Tocino, MD, Branford, CT (*Presenter*) Nothing to Disclose

PURPOSE

The purpose of this study was to evaluate the effect of a patient centered hospital wide intervention focused on reducing the number of routine portable chest x-rays (CXR) performed overnight.

METHOD AND MATERIALS

In response to patient surveys, during the spring of 2015, our institution embarked on a hospital wide initiative aimed at decreasing the number of sleep interruptions related to non-urgent tests. In the case of radiology, the "Quiet Nights" initiative concerned

mainly the non-urgent Portable Chest x-rays. Based on feedback at meetings with directors of all ICU and in-patient floors, a decision was made to stop performing routine and daily portable CXRs between the hours of 10 pm and 5 am. For 6 months prior and 6 months after the intervention, we recorded the number of routine, stat, and total portable CXRs performed during the hours of 10pm-5am. We also recorded the monthly in-patient census, and total number of portable CXRs performed each month. Statistical significance between the pre-intervention and post-intervention periods was determined using a 2 sample T test. A p-value of less than 0.05 was deemed to be statistically significant.

RESULTS

From February 2015 through July 2015, an average of 470 overnight portable chest x-rays were performed per month. The average number decreased to 91 per month after the intervention ($p<0.0001$). The number of stat overnight portable x-rays did not change significantly (average of 353 per month prior to intervention, 372 per month after intervention, $p=0.14$). No significant change ($p=0.59$) in the total number of portable x-rays performed before the intervention (4042) compared to after the intervention (4129). Inpatient census before and after the intervention remained relatively constant (778 per month before intervention, 764 per month after intervention, $p=0.3$).

CONCLUSION

The introduction of a patient centered initiative succeeded in decreasing the number of overnight sleep interruptions by not performing routine portable CXRs between the hours of 10:00PM and 5:00AM while maintaining the number of stat portable CXRs.

CLINICAL RELEVANCE/APPLICATION

By collaborating with our clinical colleagues, we were able to significantly reduce the number of overnight portable x-rays, and, as a result, the number of overnight interruptions.

CH257-SD-TUA3 Assessment of Selection Criteria for Low-dose Lung Screening CT among Asian Ethnic Groups in Taiwan - From Mass Screening to Specific Risk-based Screening for Non-smoker Lung Cancer

Station #3

Participants
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PURPOSE

The National Lung Screening Trial (NLST) showed low-dose screening chest CT reduced lung cancer mortality rate up to 20% in high risk patients in the United States. We aim to investigate the impact of applying the NLST eligibility criteria to the population in Taiwan, and to identify additional risk factors to select subjects at risk of lung cancer.

METHOD AND MATERIALS

We retrospectively review the medical record of 1763 asymptomatic healthy subjects (40~80 year old) who voluntarily underwent low-dose chest CT (1029 male, 734 female) from August 2013 to August 2014. Clinical information and nodule characteristics were recorded. Results of subsequent follow-up and outcome were also recorded.

RESULTS

8.4% (148/1763) of subjects would have been eligible for lung cancer screening based on the NLST criteria. However, only one of these eligible subjects would have a lung cancer detected at baseline. Among the 1615 subjects who did not meet the NLST criteria, the detection rates of lung cancer was 2.6% in women and 0.56% in men. Logistic regression showed that female gender and a family history of lung cancer were the two most important predictor of lung cancer in Taiwan (odds ratio of 6.367, P value = 0.003; odds ratio of 3.017, P value = 0.016, respectively).

CONCLUSION

In conclusion, NLST eligibility criteria may not be effective in screening lung cancer in Taiwan. Risk-based prediction model based on the family history of lung cancer and female gender can potentially improve efficiency of lung cancer screening programs in Taiwan.

CLINICAL RELEVANCE/APPLICATION

1. To clarify the impact of applying the NLST eligibility criteria for lung cancer screening in Taiwan
2. Female gender and family history of lung cancer were two important predictors of lung cancer3. The significantly higher prevalence of pure GGNs and subsolid nodules in subjects with family history of lung cancer
4. High-risk nodules may be more efficiently identified with specific risk factors
5. From mass screening to selective high-risk screening for non-smoker lung cancer

CH258-SD-TUA4 3D Computer-Aided Diagnosis System for Thin-Section CT: Utility for Pulmonary Functional Loss and Treatment Response Assessments in Connective Tissue Disease Patients

Station #4

Participants
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PURPOSE

To evaluate the capability of a newly developed 3D computer-aided diagnosis (CAD) system for quantitative pulmonary functional loss and treatment response assessment in connective tissue disease (CTD) patients.

METHOD AND MATERIALS

Thirty-seven consecutive CTD patients (12 male, 25 female; mean age, 59 year old) underwent initial and follow-up thin-section CTs and pulmonary function tests. In this study, total 135 follow-up examinations were performed, and divided as following three groups at each time point: stable (n=103), acute exacerbation (n=16) and after treatment (n=16) phase scans. In this study, all CT data were analyzed by a newly developed our proprietary CAD software, and percentages of following six volume extents to total lung volume were automatically calculated in each CTD patient: normal lung, ground-glass opacity (GGO) and reticulation (GGO/reticular), honeycombing, consolidation, nodular and emphysema. Then, differences of each volume between two serial CT examinations were also calculated in each patient. To determine the capability of pulmonary functional loss assessments, step-wise regression analyses were performed. To evaluate the capability for treatment response assessment, each volume and pulmonary functional changes were compared among three groups by Tukey's HSD test.

RESULTS

In the step-wise regression test, VC change was significantly affected by the following two factor changes: the first-step factor was GGO/reticulation, and the second-step factor was honey comb ($r=0.39$, $p<0.05$). On comparison of each volume change, stable and after treatment phase scan groups had significant differences with acute exacerbation phase scan group (normal lung: $p<0.0001$, GGO/reticulation: $p<0.0001$, honeycombing: $p<0.0001$, and consolidation: $p<0.0001$). In addition, consolidation volume change had significant difference between stable and after treatment phase scan groups ($p=0.0002$).

CONCLUSION

The newly developed 3D CAD system for thin-section CT has a potential for pulmonary functional loss and treatment response assessments in CTD patients.

CLINICAL RELEVANCE/APPLICATION

The newly developed 3D CAD system for thin-section CT has a potential for pulmonary functional loss and treatment response assessments in CTD patients.

CH259-SD-TUA5 Diagnostic Performance of Fourier Decomposition based Self-gated Functional Lung MRI for Detection of Thromboembolic Lung Perfusion Defects

Station #5

Participants
Andreas Kunz, MD, Wurzburg, Germany (*Presenter*) Nothing to Disclose
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Simon Veldhoen, MD, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the diagnostic performance of Fourier transform based functional lung MRI (SENCEFUL-MRI: SElf-gated Non-Contrast-Enhanced FUnctional Lung imaging) for detection of thromboembolic lung perfusion defects.

METHOD AND MATERIALS

10 patients with either acute or chronic thromboembolic perfusion defects as assessed by standard lung scintigraphy were included in the prospective study. They underwent Fourier decomposition-based MRI on a 1.5T scanner using the SENCEFUL approach (2D-FLASH sequence with quasi-random sampling for data acquisition). The lungs were segmented from the perfusion-weighted images and the perfusion information depicted in color-coded perfusion maps. Coronal lung scintigraphy images were anatomically matched with coronal SENCEFUL-maps and individually rated for perfusion deficits. The analysis was performed for 4 lung quadrants in each coronal image (right upper & lower; left upper & lower quadrant). As slice positioning, thickness and thus registered parts of the lung parenchyma per specific slice can vary between both techniques, a 3D analysis of the entire lung was added (4 lung quadrants per patient: right upper & lower; left upper & lower).

RESULTS

Slice-by-slice analysis revealed agreement between SENCEFUL-MRI and scintigraphy ratings in 88.3% of quadrants (427 quadrants, agreement in 377; ICC 0.77, p<0.05). 41 quadrants were falsely rated positive with SENCEFUL. We found sensitivity to be 0.97 and specificity to be 0.63 (PPV 0.90; NPV 0.86).Using the 3D quadrant analysis, overall rating agreement was 95%. SENCEFUL-MRI correctly identified all quadrants affected in scintigraphy (i.e. 30 of 40 quadrants; ICC 0.93, p<0,05). Only two quadrants were falsely rated positive. Here, SENCEFUL-MRI achieved a diagnostic sensitivity of 1.0 and specificity of 0.8 (PPV 0.9; NPV 1.0).

CONCLUSION

SENCEFUL-MRI and scintigraphy showed strong agreement levels for identification of pulmonary thromboembolic perfusion defects. SENCEFUL-MRI provided high sensitivity and specificity, especially for 3D quadrant analysis. Differences between 3D and slice-by-slice analyses are most probably related to varying slice thickness and positioning between MRI and scintigraphy.

CLINICAL RELEVANCE/APPLICATION

SENCEFUL-MRI bears the potential as viable alternative to lung scintigraphy for detection of thromboembolic lung diseases without disadvantages like radiation, need for i.v.-contrast or breath-holds.

CH145-ED-TUA6 Multi-Vendor Spectral CT Lung Perfusion: What Is Real and What Is Not?

Station #6

Participants
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Kiran Batra, MD, Coppell, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Review similarities and differences between the different spectral CT techniques and their implementations2. Discuss the principles and techniques of spectral CT lung perfusion and its clinical utility3. Explain artifacts encountered in iodine perfusion maps and techniques to decrease/eliminate artifacts4. Compare artifacts encountered in different techniques, such as dual-source and detector-based spectral CT5. Provide guidelines on distinguishing artifacts from pulmonary embolism

TABLE OF CONTENTS/OUTLINE

Spectral CT - basic physicsSpectral CT techniques Dual source Rapid kV switching Dual spin Detector-based spectral CT Split beam Photon countingBenefits of spectral CT in thoracic imaging Lung perfusion Decreased artificats (beam hardening) Improved vascular contrast (salvage of suboptimal studies, low contrast dose) Virtual noncontrast imagesSpectral CT lung perfusion Physical processing Image interpretationCase illustration of CT lung perfusion benefits (acute and chronic pulmonary embolism, infarct, pulmonary hypertension, small vessel disease)Artifacts and pitfalls with spectral CT lung perfusion Beam hardening Lung disease Air-soft tissue interface Cardiac and diaphragm movement Atelectasis Field of view (seen only in dual source)QuizSummary

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/

Suhny Abbara, MD - 2014 Honored Educator
Prabhakar Rajiah, MD, FRCR - 2014 Honored Educator

CH005-EB-TUA A Look at Lung Function Beyond FEV1 with Hyperpolarized 129Xenon MRI: Guide to Building a Clinical Imaging Routine -How We Do It and Why We Need It!

Hardcopy Backboard

Participants
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Justus E. Roos, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Bastiaan Driehuys, PhD, Durham, NC (*Abstract Co-Author*) Research support, General Electric Company; Royalties, General Electric Company; Stockholder, Polarean, Inc

TEACHING POINTS

The role of hyperpolarized (HP) 129Xe MRI will be elucidated in the context of current standards in lung function assessment and imaging. The audience will learn about the unique contrast mechanisms of HP129Xe MR imaging. A structured review of the technical requirements for noble gas imaging will be provided. We introduce a point-by-point directive for how to build a comprehensive imaging strategy for evaluating patients with various pulmonary conditions. An overview of the current clinical

applications of HP129Xe MRI will be provided. We will present a pictorial review of different clinical applications of HP129Xe MRI.

TABLE OF CONTENTS/OUTLINE

Introduction of standards in pulmonary function assessment and pulmonary MRI. Identify the inherent shortcomings hampering traditional pulmonary function tests and imaging. Revisit the technical prerequisites for noble gas MRI (scanner, coils, gas and polarizer). Summary of an image protocol consisting of anatomical and functional sequences. Safety considerations. Clinical applications and appropriate interpretation of results. Pictorial review of sample cases from our institution comprising cases of asthma, IPF and bronchial stenosis quantification. Elaborate the incremental clinical value of HP129Xe MRI. Outlook.

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/

H. Page McAdams, MD - 2012 Honored Educator

RCC33

Computer-Aided Diagnosis: Effective Use of Computer-Aided Diagnose in Clinical Practice

Tuesday, Nov. 29 12:30PM - 2:00PM Room: S501ABC

BR CH GI IN

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

FDA Discussions may include off-label uses.

Participants
Hiroyuki Yoshida, PhD, Boston, MA, (yoshida.hiro@mgh.harvard.edu) (*Moderator*) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

LEARNING OBJECTIVES

Learn about 1) the best uses of CAD in clinical practice, 2) current and upcoming reading paradigms for clinical use, 3) strengths and weaknesses of CAD systems, 4) characteristics and pitfalls of CAD prompts, 5) how to best incorporate CAD results into the diagnostic decision-making process.

ABSTRACT

Computer-aided diagnosis (CAD) has become a standard tool in diagnostic radiology. This refresher course will explain and demonstrate how to use three widely available CAD systems--breast CAD, lung CAD, and colon CAD--effectively in clinical practice. The purpose of CAD is to improve radiologists' diagnostic accuracy. A number of CAD systems have been made commercially available in the United States and worldwide, including CAD for the detection of breast cancer on mammograms and breast tomosynthesis, detection of lung nodules on chest radiographs and on thoracic CT, as well as detection of polyps on CT colonography. However, the use of CAD in clinical practice has not been well standardized, and its most effective use is not understood well by radiologists. Each CAD system has its own unique strengths and weaknesses depending on how it was developed and on the data that were used for its development. A good understanding of the intended use of CAD and its limitations in different modalities is important, because using CAD beyond its limitations can lead to ineffective or even harmful results. This course will provide the best CAD practices in clinical use, current and upcoming reader paradigms for clinical use, strengths and weaknesses of different CAD systems, characteristics of CAD prompts including pitfalls, and how to best incorporate CAD results into the diagnostic-decision making process.

Sub-Events

RCC33A Effective Use of Breast Computer-Aided Diagnosis in Clinical Practice

Participants
Robert M. Nishikawa, PhD, Pittsburgh, PA, (nishikawarm@upmc.edu) (*Presenter*) Royalties, Hologic, Inc; Research Consultant, iCAD, Inc;

LEARNING OBJECTIVES

1) Learn current state of computer-aided detection in screening mammography. 2) Learn new possible ways to implement computer-aided detection clinically. 3) Learn how computer-aided detection is used clinically affects its effectiveness.

ABSTRACT

RCC33B Effective Use of Lung Computer-Aided Diagnosis in Clinical Practice

Participants
Matthew T. Freedman, MD, MBA, Baltimore, MD (*Presenter*) Institutional research contract, Riverain Technologies, LLC

LEARNING OBJECTIVES

1) Be aware that CADe and image processing approaches are available to help them (a) detect lung nodules and lung cancer on chest radiographs and lung CTs, (b) the detection of change, the detection of tubes, lines and catheters on chest radiographs, and (c) to measure the extent of COPD, 2) Computer image processing approaches can suppress the visibility of ribs on chest radiographs and pulmonary blood vessels on CTs. 3) They will be informed that some CADe devices, in clinical tests, decrease the time for the detection of lung nodules and the localization of tubes, lines and catheters. 4) They will better understand a basic approach to start to select CADe software for their own clinical practices.

Active Handout:Matthew T. Freedman

http://abstract.rsna.org/uploads/2016/16005049/ACTIVE RCC33B.pdf

RCC33C Effective Use of Colon Computer-Aided Diagnosis in Clinical Practice

Participants
Stuart A. Taylor, MBBS, London, United Kingdom, (stuart.taylor1@nhs.net) (*Presenter*) Research Consultant, Robarts Clinical Trials, Inc

LEARNING OBJECTIVES

1) To understand the rational for CAD in CT colonography. 2) To appreciate the diagnostic accuracy of CAD in detecting colonic neoplasia according to lesion morphology. 3) To learn about the various CAD reading paradigms used in CT colonography, and the pros and cons of each. 4) To understand how colon CAD can be integrated into clinical practice.

CHS-TUB

Chest Tuesday Poster Discussions

Tuesday, Nov. 29 12:45PM - 1:15PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Sushilkumar K. Sonavane, MD, Birmingham, AL (*Moderator*) Nothing to Disclose

Sub-Events

CH260-SD-TUB1 Quantification of Lung Perfusion Blood Volume (lung PBV) by Dual-energy CT in Patients with Chronic Thromboembolic Pulmonary Hypertension (CTEPH) before and after Balloon Pulmonary Angioplasty (BPA): Preliminary Results

Station #1

Participants
Hirofumi Koike, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Eijun Sueyoshi, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Ichiro Sakamoto, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoo Nakata, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Kouji Maemura, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Balloon pulmonary angioplasty (BPA) is a treatment option for patients with chronic thromboembolic pulmonary hypertension (CTEPH). Its effect on pulmonary perfusion has not been quantified; we examined the clinical significance of pulmonary blood volume (PBV) using dual-energy computed tomography (DECT) in patients with CTEPH undergoing BPA.

METHOD AND MATERIALS

In this retrospective study of 16 BPAs in eight female patients with CTEPH, we evaluated both-lung (n=16), right- or left-lung (n=32), and three right- or left-segment (upper, middle, and lower) (n=96) PBVs before and after BPA, using DECT. We evaluated the relationships between improvement in lung PBV and pulmonary artery (PA) pressure (PAP), cardiac index (CI), pulmonary vascular resistance (PVR), and 6-min walking distance. We measured PA enhancement (PAenh) on DECT images and calculated lung PBV/PAenh to adjust timing.

RESULTS

Pre- and post-BPA 6-segment lung PBV/PAenh were 0.067±0.021 and 0.077±0.019, respectively, in the treated segment ($p<0.0001$). There were significant positive correlations between pre- to post-BPA improvements in both-lung PBV/PAenh and PAP ($R=0.69$, $p=0.005$), PVR ($R=0.56$, $p=0.03$), and 6-min walking distance ($R=0.67$, $p=0.01$).

CONCLUSION

Improved PBV after BPA, reflecting increased lung perfusion, was positively correlated with PAP, PVR, and 6-min walking distance. Lung PBV may be an indicator of BPA treatment effect.

CLINICAL RELEVANCE/APPLICATION

Lung PBV may be an indicator of BPA treatment effect.

CH261-SD-TUB2 Type B Intramural Hematoma of the Aorta: Clinical Importance of Minimal Enhancement of the Thrombosed False Lumen on CT

Station #2

Participants
Eijun Sueyoshi, MD, Nagasaki, Japan (*Presenter*) Nothing to Disclose
Hiroki Nagayama, Shimabara, Japan (*Abstract Co-Author*) Nothing to Disclose
Ichiro Sakamoto, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Uetani, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the instability, morphology, natural course, and prognostic value of enhancement of the thrombosed false lumen on contrast-enhanced CT scans in patients with type B intramural hematoma of the aorta (IMH).

METHOD AND MATERIALS

The ethics committee of our hospital approved this study. A total of 65 patients (42 men; mean age: 75 years) with type B IMH were retrospectively evaluated between 2007 and 2014. On initial CT scans, attenuation of the false lumen (AFL) was determined before enhancement and in the early and delayed phases of contrast enhancement. Then enhancement of the false lumen (EFL) was calculated (AFL in the delayed image – AFL in the precontrast image). The Cox proportional hazards model was employed to estimate the risk of IMH-related events, including death or surgical repair.

RESULTS

The mean AFL for precontrast CT, arterial phase enhanced CT, and delayed phase enhanced CT was 56.3±10.5, 59.9±10.8, and 63.7±11.1 HU, respectively, while the mean EFL was 7.4±9.0 HU.According to multivariate Cox regression analysis, EFL was the only independent predictor of IMH-related events (n=23) (hazard ratio, 1.008; 95% CI, 1.03 –1.15; P=0.0044) and IMH-related death/surgical repair (n=10) (hazard ratio, 1.111; 95% CI, 1.017 –1.213; P=0.0197).

CONCLUSION

In patients with IMH, EFL is the most powerful predictor of IMH-related events, as well as IMH-related death or surgical repair. Patients with type B IMH who have a high EFL should be followed more carefully by surveillance imaging than patients with a low EFL.

CLINICAL RELEVANCE/APPLICATION

Type B IMH patients with a high enhancement of the false lumen (EFL) should be monitored more carefully by imaging during follow-up than those with a low EFL.

CH262-SD-TUB3 Mycobacterium Tuberculosis Infection in HIV Positive Patients: HRCT Evaluation

Station #3

Participants
Akash Rajaram, MBBS,MD, Bangalore, India (*Presenter*) Nothing to Disclose
Sanjaya Viswamitra, MD, Bengaluru, India (*Abstract Co-Author*) Nothing to Disclose
Ashok Adekal, MD, Bangalore, India (*Abstract Co-Author*) Nothing to Disclose
SRINATH MG, BANGALORE, India (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

1. To learn the HRCT findings of pulmonary tuberculosis in HIV positive patients. 2. To correlate the mortality rate and CD4 count with HRCT findings.

METHOD AND MATERIALS

The study was a hospital based retrospective study. Five hundred cases were reviewed from the past seven years. The HRCT findings from patients diagnosed with pulmonary TB, established by M. tuberculosis detection in bronchoalveolar lavage or sputum/biopsy samples. Two observers independently reviewed HRCT images and decided on the presence and distribution of: (i) miliary nodules, (ii) cavitation (iii) centrilobular tree-in-bud nodules, (iii) ground-glass attenuation and consolidation, (iv) pleural effusion and (v) mediastinal lymphadenopathy.

RESULTS

500 patients [330 males, 170 females; median age, 48 years (range, 17–69 years)]. The main HRCT pattern was miliary nodules (45%), followed by cavitation (15%), centrilobular tree-in-bud nodules (8%), ground-glass attenuation and consolidation (10%), pleural effusion (10%) and mediastinal lymph node enlargement (12%). The miliary nodules were randomly distributed. In patients with cavitation and centrilobular tree-in-bud nodules, 70% of abnormalities were found in the upper lobes. Pleural effusion was unilateral in 70% of cases. The overall mortality rate was 30%. The mortality rate was increased significantly in patients with miliary nodules ($p < 0.05$). It was 56% in these patients. The mean CD4 count was lowest in patients with milliary nodules.

CONCLUSION

The main HRCT finding in HIV positive patients with pulmonary TB was miliary nodules, followed by cavitation. Miliary nodules were associated with a worse prognosis in these patients. The CD4 count was the lowest in patients with miliary nodules.

CLINICAL RELEVANCE/APPLICATION

HRCT findings of pulmonary tuberculosis in HIV positive patients aids to the diagnosis and prognosis of the disease and is recommended in the initial evaluation of high risk population.

CH263-SD-TUB4 Quantitative Chest CT for Predicting Survival in Patients with Restrictive Allograft Syndrome

Station #4

Participants
Miho Horie, MSc, Toronto, ON (*Presenter*) Research Grant, Toshiba Corporation
Pascal Salazar, Minnetonka, MN (*Abstract Co-Author*) Employee, Toshiba Corporation
Tomohito Saito, MD, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Tereza Martinu, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Shafique Keshavjee, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Narinder S. Paul, MD, Toronto, ON (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Carestream Health, Inc

PURPOSE

Chronic lung allograft dysfunction (CLAD) limits long-term survival following lung transplantation (LTx). Restrictive Allograft Syndrome (RAS) is a particularly aggressive sub-type of CLAD and a significant cause of morbidity and mortality. There is no established prognostic indicator for RAS. The purpose of this study was to investigate the utility of quantitative lung density analysis in predicting patient survival at time of RAS diagnosis.

METHOD AND MATERIALS

A retrospective study of patients following bilateral LTx who underwent surveillance with corresponding pulmonary function tests (PFT) and low dose CT (120kV, 50mA, 0.5s) was conducted. 22 patients were diagnosed with RAS (Average of 26 months after LTx) on the basis of abnormal PFT (FEV1<80% and TLC<90% of post-LTx baseline). The CT density of lung parenchyma for each patient was plotted as a histogram and evaluated quantitatively using customized software and a 3D post processing workstation (Vitrea, Vital Images, Minn). The relative contributions of low and high density areas from each lung were determined from the histogram. Nonparametric indices were calculated; including the right tail weight (rqw) and the left tail weight (lqw) of the CT

density distribution as well as the ratio: log (rqw0.75/lqw 0.25). A higher tail ratio indicates more high-density regions (e.g. fibrosis) compared with low-density regions (e.g. emphysema). The maximum values for each patient were obtained. The Spearman's correlation coefficient was calculated to evaluate the correlation between the survival post RAS diagnosis and the tail ratio. The area under the Receiver Operating Characteristic curve (AUC) was calculated for prediction of survival times (>1-year versus ≤ 1-year).

RESULTS

The Spearman's correlation coefficient showed a moderate correlation, r = -0.49 (P<0.05) between the survival post RAS diagnosis and the tail ratio. The AUC was 0.73 with a sensitivity of 89% and specificity of 54% when the optimal criterion tail ratio value (0.65) was selected for prediction of 1-year survival.

CONCLUSION

In patients with RAS, quantitative parameters derived from a lung density histogram may predict the 1-year survival after the clinical diagnosis.

CLINICAL RELEVANCE/APPLICATION

A quantitative metric for RAS patients that helps to determine likelihood of survival 1-year post diagnosis may be useful for patient management.

CH264-SD-TUB5 Accuracy of Hyperpolarized 129Xe Ventilation MRI in Obstructive Pulmonary Disease: A Retrospective Case-control Study

Station #5

Participants
Lukas Ebner, MD, Durham, NC (*Presenter*) Nothing to Disclose
Rohan Virgincar, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Andreas Christe, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Achille Mileto, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Joseph G. Mammarappallil, MD, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Mu He, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
H. Page McAdams, MD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Consultant, MedQIA Imaging Core Laboratory ; Author, Reed Elsevier; Author, UpToDate, Inc; Research Consultant, F. Hoffmann-La Roche Ltd; Research Consultant, Boehringer-Ingelheim GmbH
Bastiaan Driehuys, PhD, Durham, NC (*Abstract Co-Author*) Research support, General Electric Company; Royalties, General Electric Company; Stockholder, Polarean, Inc
Justus E. Roos, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the diagnostic accuracy of hyperpolarized (HP)129Xe MR imaging in detecting ventilation defects in obstructive lung disease by using a multi-reader based approach.

METHOD AND MATERIALS

This retrospective, HIPAA-compliant study was approved by our IRB; informed consent was obtained prior to enrolment. From 2012 through 2015, 66 subjects (n=38 healthy volunteers [mean age, 41 years]; asthma patients, n=20 [mean age, 44 years]; COPD patients, n=8 [mean age, 67 years]) underwent HP129Xe ventilation MR imaging at 1.5T, following inhalation of 0.5-1 liter of isotopically enriched 129Xe gas (83% 129Xe, polarized to 20% by spin-exchange optical pumping). 129Xe ventilation MR images were reconstructed and assessed by five blinded, independent readers for the presence of ventilation defects using a percentage scoring-system (0-100%). Pre-MR pulmonary function testing (PFT), which was prospectively obtained in all study participants, represented the reference standard for establishing the presence of airway obstruction (diagnostic threshold: FEV1%<0.8; FEV1/FVC<0.70). A linear regression analysis was employed to compare reader-based scores from 129Xe ventilation MR imaging assessment and PFTs. Sensitivity, specificity and diagnostic accuracy of 129Xe ventilation MRI in detecting ventilation defects were estimated using a receiving operating characteristic (ROC) analysis. Inter-rater agreement was assessed by using kappa statistics.

RESULTS

Reader-based scores of 129Xe ventilation MR images were significantly higher in patients with airway obstruction compared to healthy subjects (P<.0001). 129Xe ventilation MRI showed a moderate correlation with FEV1% (R2=.378), whereas it strongly correlated with FEV1/FVC (R2=.664). Our ROC analyses showed that an optimized threshold of 12% from reader-based scores of 129Xe ventilation MR images yielded a sensitivity of 86%, specificity of 93%, and an overall diagnostic accuracy of 91% for detection of ventilation defects. There was a moderate agreement among the five readers (κ=.44).

CONCLUSION

HP129Xe ventilation MR imaging can accurately detect ventilation defects in patients with obstructive, pulmonary disease.

CLINICAL RELEVANCE/APPLICATION

HP129Xe MRI is clinically useful in detecting ventilation defects in obstructive, pulmonary disease. Based on our findings, it might also be used for monitoring regional ventilation changes.

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/

H. Page McAdams, MD - 2012 Honored Educator

Awards

CH148-ED-TUB6 Added Value of Functional Lung MRI for Improved Patient Care: Current Techniques and Future Perspectives

Station #6

Certificate of Merit

Participants
Julius Renne, MD, Hannover, Germany (*Presenter*) Nothing to Disclose
Till F. Kaireit, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian O. Schoenfeld, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Christoph P. Czerner, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Voskrebenzev, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Marcel Gutberlet, Dipl Phys, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Agilo L. Kern, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank K. Wacker, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Pro Medicus Limited; Research Grant, Delcath Systems, Inc;
Jens Vogel-Claussen, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Familiarize the readers with MRI techniques for regional pulmonary function assessment, including proton MRI as well as fluorine and hyperpolarized gas MRI.2. To learn about advantages and drawbacks of functional lung MRI techniques.3. To learn about current clinical applications and promising future clinical applications of functional lung MRI.

TABLE OF CONTENTS/OUTLINE

1. Brief summary of morphological MRI sequences.2. Pulmonary functional imaging, the technical prerequisites:i. Proton MRIii. Fluorinated gas MRIiii. Hyperpolarized gas MRI3. Advantages and drawbacks of each technique, emphasizing on practical aspects in clinical routine as well as in the research environment.4. Overview of recent studies and clinical applications in different disease areas of the introduced techniques.5. Future perspectives.

CH205-ED-TUB7 Recurrence Patterns Post Treatment for Early Stage Lung Cancer and the Emerging Evidence for Imaging Surveillance: A Pictorial Review

Station #7

Participants
Orla Drumm, MBBCh, MSc, Dublin, Ireland (*Abstract Co-Author*) Nothing to Disclose
Eoghan J. McCarthy, MBBCh, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
John Kavanagh, FFR(RCSI), FRCR, Dublin, ON (*Abstract Co-Author*) Nothing to Disclose
Peter Beddy, MD, FRCR, Dublin, Ireland (*Presenter*) Nothing to Disclose

TEACHING POINTS

Teaching Points1. Identify common sites of disease recurrence post radical treatment for early stage lung cancer2. Learn how to detect lung cancer recurrence - assessment for disease recurrence requires knowledge of the normal post treatment appearance and how this can change over time, especially post SBRT and ablation.3. Illustrate the current guidelines for surveillance post curative treatment of early stage disease and update on the recently published literature on imaging follow up (table 1).

TABLE OF CONTENTS/OUTLINE

OverviewSurgery remains the gold standard treatment for early stage disease in suitable candidates however Stereotactic Body Radiotherapy (SBRT) and percutaneous ablation are effective alternatives.Recurrence PatternsThe risk of recurrence post treatment for early stage disease ranges from 15-30% depending on the patient cohort and treatment employed. This exhibit will review the common local and distance recurrence patterns for each treatment modality. Tips and TricksThe clinical cases will highlight how to identify recurrent disease and differentiate from post treatment changeEvidence for Imaging Follow-upDiscuss the evidence behind current imaging surveillance guidelines. The review will also focus on new evidence to support PET-CT surveillance for patients treated with SBRT and lung ablation.

VSIO31

Interventional Oncology Series: Lung and Musculoskeletal

Tuesday, Nov. 29 1:30PM - 6:00PM Room: S405AB

CH MK IR

AMA PRA Category 1 Credits ™: 4.50
ARRT Category A+ Credits: 5.00

FDA Discussions may include off-label uses.

Participants
Matthew R. Callstrom, MD, PhD, Rochester, MN, (Callstrom.matthew@mayo.edu) (*Moderator*) Research Grant, Thermedical, Inc
Research Grant, General Electric Company Research Grant, Siemens AG Research Grant, Galil Medical Ltd
Sean M. Tutton, MD, Milwaukee, WI (*Moderator*) Consultant, Benvenue Medical, Inc

LEARNING OBJECTIVES

1) Describe patients that are appropriate for ablation for lung and MSK tumors. 2) Describe the relative role of ablation with other treatments for lung and MSK tumors. 3) Describe outcome of the use of ablation for the treatment of lung and MSK tumors.

ABSTRACT

Sub-Events

VSIO31-01 Ablation Should Be First Option for Limited Metastatic Disease

Tuesday, Nov. 29 1:30PM - 1:50PM Room: S405AB

Participants
Stephen B. Solomon, MD, New York, NY (*Presenter*) Research Grant, General Electric Company

VSIO31-02 Possibility of Pathological and Genetic Analysis of Percutaneous Needle Biopsy Performed Immediately after Lung Radiofrequency Ablation

Tuesday, Nov. 29 1:50PM - 2:00PM Room: S405AB

Participants
Takaaki Hasegawa, Nagoya, Japan (*Presenter*) Nothing to Disclose
Chiaki Kondo, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Yozo Sato, MD, PhD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshitaka Inaba, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Hidekazu Yamaura I, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Mina Kato, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Shinichi Murata, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Yui Onoda, MD, Shinagawa-ku, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasushi Yatabe, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the possibility of pathological diagnosis and genetic mutation analysis for the specimen of percutaneous needle biopsy obtained immediately after lung radiofrequency ablation (RFA).

METHOD AND MATERIALS

During May 2013 to February 2016, 19 patients (8 male and 11 female; median age, 68 years; range, 52–88 years) underwent percutaneous needle biopsy immediately after RFA for 19 lung tumors of 0.5–2.6 cm (mean, 1.6±0.5 cm). Thirteen tumors were solid and 6 were consisted dominantly of ground-glass opacity (GGO). All specimens were pathologically classified using standard hematoxylin and eosin (H&E) staining and adding immunostaining as necessary. Genetic mutation of EGFR and KRAS was examined for the specimens containing tumor cells. The safety and technical success of the procedure and the possibility of pathological diagnosis and genetic mutation analysis were evaluated. Safety of the whole procedure was evaluated by using complication grading system of the Society of Interventional Radiology.

RESULTS

Nineteen patients were completed with both lung RFA and needle biopsy. Major complications occurred in 2 patients (11%, 2/19) (grade-D aseptic pleuritis (n=1) and grade-C pneumothorax with tube placement (n=1)) and minor complications occurred in 9 patients (47%, 9/19) (grade-B pneumothorax without tube placement (n=8) and self-limiting hemoptysis (n=1)). Tumor seeding was not seen during the median follow up of 9 months (range, 1-28 months). Tumor tissue was obtained in 16 patients, so technical success rate was 84% (16/19). Only normal pulmonary epithelium was obtained in 3 patients (16%, 3/19) with GGO dominant tumors. Pathological diagnosis was achieved in 14 patients, so pathological diagnosability rate was 74% (14/19). Although atypical cell was obtained, pathological diagnosis was not able to determine in 2 patients. Among 16 specimens containing tumor cell, both EGFR and KRAS mutation was able to analyze in 13 specimens (68%, 13/19). EGFR mutation could not be evaluated in 1 patient and KRAS mutation could not be in 2 patients, due to insufficient tumor cells.

CONCLUSION

Pathological diagnosis and genetic analysis were possible even for specimen obtained immediately after RFA for lung tumor.

CLINICAL RELEVANCE/APPLICATION

Percutaneous needle biopsy was feasibly performed immediately after lung RFA and the obtained specimen could be evaluated pathologically or genetically.

VSIO31-03 Outcomes with SBRT in the Treatment of Metastatic Lung Tumors

Tuesday, Nov. 29 2:00PM - 2:20PM Room: S405AB

Participants
Kenneth R. Olivier, MD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the technique and delivery of Lung SBRT. 2) Discuss the role of Lung SBRT in treatment of Oligometastatic Disease. 3) Compare SBRT to other modalities used in this context.

ABSTRACT

VSIO31-04 VATS Resection with Radionucleotide Localization - Effective Treatment for Small Lung Nodules

Tuesday, Nov. 29 2:20PM - 2:40PM Room: S405AB

Participants
Robert K. Shen, MD, Rochester, MN, (shen.krobert@mayo.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an understanding of the technique using CT-guided placement of radionucleotide to localize small indeterminate lung nodules to facilitate thoracoscopic resection. At the conclusion of the presentation the learner should have an undertanding of the rationale for such an approach, the technical details of performing this technique, the indications for the technique and the outcomes of surgery performed using this technique.

ABSTRACT

VATS Resection with Radionucleotide Localization-Effective Treatment for Small Indeterminate Lung NodulesK. Robert Shen, M.D.Mayo ClinicDivision of General Thoracic Surgery The increased use of chest computed tomography (CT) in lung cancer screening programs and for various clinical applications has led to identification of significant numbers of indeterminate lung nodules. Improved CT technology allows diagnosis of not only more nodules, but also increasingly smaller nodules. Thoracic surgeons are now being called on to evaluate these lesions for the possibility of malignancy, often in the setting of high-risk patients with significant smoking histories. Although short-term follow-up imaging may often suggest either benignity or malignancy, caution should be exercised in accepting a benign diagnosis without tissue confirmation. Additionally, given evidence that tumor size directly impacts survival even within subgroups of stage IA tumors, it makes intuitive sense to attempt to treat potential cancers as early as possible.1 We and others have found that small lung nodules, particularly subcentimeter nodules, cannot be reliably biopsied percutaneously. Often, the most expedient and direct path to definitive management of a suspicious indeterminate small pulmonary nodule is to proceed with surgical excisional biopsy. Thoracoscopic surgery carries less morbidity than diagnostic procedures performed through thoracotomy, but is limited by the frequent inability to see or palpate (digitally or instrumentally) small subpleural lesions. To overcome this limitation, several different thoracoscopic nodule localization techniques have been developed and have been reported to improve the ease and accuracy of thoracoscopic biopsy. These include the use of visual markers, such as methylene blue and hook wires, fluoroscopic localization using various radiopaque markers, radiotracer localization techniques, and more recently, thoracic endosonography. All of these techniques have their own advantages and disadvantages, as well as significant learning curves. Several years ago, we modified a technique utilizing CT-guided radiotracer injection followed by intraoperative thoracoscopic radioprobe localization as the preferred method for finding nodules that we anticipate preoperatively will be difficult to see or palpate. In this presentation, I will review our experience using this technique. ReferencesStiles BM, Altes TA, Jones DR, Shen KR, Ailawadi G, Gay SB, Olazagasti J, Rehm PK, Daniel TM.Clinical experience with radiotracer-guided thoracoscopic biopsy of small, indeterminate lung nodules.Ann Thorac Surg 2006; 82:1191. Grogan EL, Jones DR, Kozower BD, Simons WD, Daniel TM.Identification of small nodules: technique of radio-tracer guided thoracoscopic biopsy.Ann Thorac Surg 2008; Feb 85(2): S772-7.

VSIO31-05 Palliative Treatment of Painful Bone Metastases with MR Imaging-guided Focused Ultrasound Surgery: A Two-centre Study

Tuesday, Nov. 29 2:40PM - 2:50PM Room: S405AB

Participants
Alessandro Napoli, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Andrea Leonardi, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Fabrizio Andrani, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Vincenzo Noce, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Alberto Bazzocchi, MD, Bologna, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the efficacy of non-invasive high intensity MR guided focused Ultrasound Surgery (MRgFUS) for pain palliation of bone metastasis in patients over a large population.

METHOD AND MATERIALS

This prospective, single arm, two-centre study received IRB approval. 102 patients (female: 38, male: 64, mean age: 62,3) with painful bone metastases were enrolled. 121 non-spinal lesions underwent MRgFUS treatment using ExAblate 2100 system (InSightec). European Organization for Research and Treatment of Cancer QLQ- BM22 was used for clinical assessment additionally to Visual Analog Scale (VAS), at baseline and 1, 3 and 6 months after treatment. All patients underwent CT and MRI before treatment and 3-6 months afterward.

RESULTS

No treatment-related adverse events were recorded. 48/102 (47%) patients reported complete response to treatment and discontinued medications. 39/102 (38,2%) experienced a pain score reduction >2 points, consistent with partial response. Remaining 15 (14,7%) patients had recurrence after treatment. Statistically significant differences between baseline (6, 95%CI 5-

8) and follow-up (2, 95%CI 0-3) VAS values and medication intake were observed (p<0.05). Similarly a significant difference was found for QLQ- BM22 between baseline and follow-up (p<0.05).

CONCLUSION

MRgFUS can be safely and effectively be adopted for treatment of painful bone metastases.

CLINICAL RELEVANCE/APPLICATION

MRgFUS can be safely and effectively used as totally noninvasive treatment for pain palliation of acoustically accessible bone metastasis

VSIO31-06 Cryoablation is the Best Option for Ablation of Pulmonary Metastases

Tuesday, Nov. 29 2:50PM - 3:10PM Room: S405AB

Participants
Thierry Debaere, Villejuif, France (*Presenter*) Consultant, Terumo Corporation; Speaker, Terumo Corporation; Proctor, Galil Medical Ltd; Data Safety Monitoring Board, Medtronic plc

LEARNING OBJECTIVES

1) Select best candidate for lung cryoabalation. 2) Apply adequate treatment algorythm for cryoabalation in the lungs. 3) Understand pattern of imaging follow-up after lung cryoablation.

VSIO31-07 MW not RF Ablation is the Best Option for Ablation of Pulmonary Metastases

Tuesday, Nov. 29 3:10PM - 3:30PM Room: S405AB

Participants
Damian E. Dupuy, MD, Providence, RI (*Presenter*) Research Grant, NeuWave Medical Inc Board of Directors, BSD Medical Corporation Stockholder, BSD Medical Corporation Speaker, Educational Symposia

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/

Damian E. Dupuy, MD - 2012 Honored Educator

VSIO31-08 Mid-Term Ablation Zone Evolution Following Microwave Ablation of Normal Swine Lung

Tuesday, Nov. 29 3:30PM - 3:40PM Room: S405AB

Participants
Hiroshi Kodama, MD, New York, NY (*Presenter*) Nothing to Disclose
Song Gao, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Eisuke Ueshima, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Kreg Howk, Mansfield, MA (*Abstract Co-Author*) Nothing to Disclose
Stephen B. Solomon, MD, New York, NY (*Abstract Co-Author*) Research Grant, General Electric Company
Govindarajan Srimathveeravalli, PhD, New York, NY (*Abstract Co-Author*) Support, Medtronic plc

PURPOSE

To compare CT images of microwave ablation (MWA) of lung in a porcine model with gross ablation zone measurements to understand evolution of treatment zone dimensions over 28 days.

METHOD AND MATERIALS

Twenty-two percutaneous microwave (Emprint™, Covidien) unilateral lung ablations were performed in 8 swine (2-3 ablations/animal). All sites were ablated at 100W for either 2 minutes (low; 14 ablations) or 10 minutes (high; 8 ablations, at least one/animal). Animals were sacrificed at 2 days (n=4) or 28 days (n=4) after the procedure. Non-contrast and dual-phase (30s and 90s) CECT imaging was performed post-treatment and prior to sacrifice in all animals. Animals sacrificed at 28 days were also imaged on days 7 and 14. Lungs and trachea were removed en-bloc after euthanasia, perfusion fixed with formalin, step sectioned at 3-5mm thickness and photographed at high resolution. CT and anatomical measurements were aggregated as mean ± standard deviation, differences in measurements were evaluated with T-test, p<0.05 was considered statistically significant.

RESULTS

In both treatment groups, ablation volume measured on CT was maximum at 7 days (high: 23.1±11.1 cm3; low: 9.2±5.2 cm3) and significantly larger compared to immediate post-ablation volume (high: 9.0±3.5 cm3; low: 3.5±1.8 cm3), P=0.004. Two-axis measurements performed on the largest ablation cross section on CT corresponded well with gross ablation measurements for both high (CT: 3.5±0.5x2.4±0.4 cm vs. Gross: 3.3±0.6x2.1±0.2 cm at 2days, CT: 2.7±1.0x1.9±1.0 cm vs. Gross: 2.7±0.9x1.9±0.8 cm at 28 days; no statistical difference) and low (CT: 2.3±0.5x1.5±0.3 cm vs. Gross: 1.9±0.5x1.3±0.3 cm at 2 days, CT: 1.4±0.5x1.0±0.4 cm vs. Gross: 1.2±0.5x0.9±0.3 cm; no statistical difference) dose ablations.

CONCLUSION

CT imaging correlates with the gross pathology size at 2 and 28 days following microwave ablation of normal swine lung. Volume of treatment zone can vary substantially, achieving largest size 7 days post-treatment.

CLINICAL RELEVANCE/APPLICATION

Follow-up imaging in patients must be performed within 2 or after 28 days after ablation to ensure accuracy.

VSIO31-09 Lung Tumor Board

Tuesday, Nov. 29 3:40PM - 3:55PM Room: S405AB

Participants
Matthew R. Callstrom, MD, PhD, Rochester, MN, (Callstrom.matthew@mayo.edu) (*Moderator*) Research Grant, Thermedical, Inc Research Grant, General Electric Company Research Grant, Siemens AG Research Grant, Galil Medical Ltd

LEARNING OBJECTIVES

1) Describe patients that are appropriate for ablation for lung tumors. 2) Describe the relative role of ablation with other treatments for lung tumors. 3) Describe outcome of the use of ablation for the treatment of lung tumors.

VSIO31-10 Technical Approaches to Treatment of Metastatic Disease in the Pelvis

Tuesday, Nov. 29 3:55PM - 4:15PM Room: S405AB

Participants
Sean M. Tutton, MD, Milwaukee, WI (*Presenter*) Consultant, Benvenue Medical, Inc

VSIO31-11 Skeletal Metastases Treated by MR-guided Focused Ultrasound: Dynamic Contrast-Enhanced MRI (DCE-MRI) for Treatment Response Evaluation

Tuesday, Nov. 29 4:15PM - 4:25PM Room: S405AB

Participants
Vincenzo Noce, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Carola Palla, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Susan Dababou, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Cristina Marrocchio, rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Alessandro Napoli, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare DCE-MRI findings in skeletal metastases treated with MR-guided Focused Ultrasound (MRgFUS) with clinical outcome assessed by visual analogue scale (VAS)

METHOD AND MATERIALS

Eighteen patients, enrolled for MRgFUS treatment for symptomatic skeletal metastases, underwent Dynamic Contrast-Enhanced MR exam (3T Discovery 750 scanner, GE; Gd-BOPTA, Bracco) before and 3 months after the ablative procedure. Perfusional parameters comprehended DCE transfer rate (Ktrans) and extravascular volume fraction (ve), calculated by dedicated analysis software. Every subject was monitored over the following three months to define clinical outcome in terms of pain relief

RESULTS

Fourteen of eighteen treated subjects demonstrated a clinical complete response (CR), with a VAS score mean reduction of 4,3 (47,8%. p<0,001), whereas four patients showed a partial clinical response (PR) with incomplete relief according to VAS scale. Perfusional analysis demonstrated in CR population significant decrease of Gadolinium extraction (mean Ktrans reduction 2,14/min, ΔKt=52,65%. p<0,01) and ve increase (5,6%. p>0,01). Partial Responders showed no substantial modification in Ktrans value (ΔKt=+0,042/min, +11,39%. p<0,01) or increase in extravascular volume. Spearman test revealed a significant relationship between Ktrans quantitative parameters and symptoms decrease evaluated by VAS scale (p<0,001) in both CR and PR patients

CONCLUSION

Ktrans negative modifications (-ΔKt) may reflect effectiveness of ultrasound ablation procedure, as direct expression of decreased tumoral cells' metabolism, and positively correlate to clinical response

CLINICAL RELEVANCE/APPLICATION

DCE-MRI reflects clinical outcome in MRgFUS treated bone metastases. Perfusional data may be routinely included in imaging protocols for MRgFUS planning and follow-up

VSIO31-12 Surgical Management Using Cryoblation in MSK Tumors

Tuesday, Nov. 29 4:25PM - 4:45PM Room: S405AB

Participants
Bennie Lindeque, MD, PhD, Aurora, CO (*Presenter*) Research Grant, Endocare, Inc

LEARNING OBJECTIVES

Audience should be able to identify the problem tumors that need a multi-disciplinary approach. They should be able to identify the members of the multi-disciplinary treatment team. They should be able to note the indication for interventional action taken by the Orthopedic oncologist. They should be able to identify which interventional procedure (cryoablation, vascular embolization or RFA) would be most applicable for a specific case.

VSIO31-13 Preoperative Transcatheter Arterial Embolization of Bone Tumors

Tuesday, Nov. 29 4:45PM - 4:55PM Room: S405AB

Awards
Student Travel Stipend Award

Participants

Ashley Altman, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Mikin V. Patel, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Steven M. Zangan, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Brian S. Funaki, MD, Riverside, IL (*Abstract Co-Author*) Data Safety Monitoring Board, Novate Medical Ltd

PURPOSE

To evaluate pre-operative embolization for surgical resection of primary and metastatic bone tumors.

METHOD AND MATERIALS

We retrospectively evaluated 58 patients (31 men, 19 women, 4 boys, 4 girls median age 56.5 years, age range 12-80 years) who underwent 52 preoperative transcatheter arterial embolizations between 2004 and 2015. Surgery was performed within 48 hours in 96.6% (57/59) of cases undergoing preoperative angiogram. Bone tumors included renal cell carcinoma (n=26), plasma cell (n=8), aneurysmal bone cyst (n=4), thyroid metastasis (n=2), giant cell tumor (n=2), chondroblastoma (n=2), melanoma metastasis (n=2), osteosarcoma (n=1), NSCLC (n=1), liposarcoma (n=1), malignant fibrous histiocytoma (n=1). Pathologic fractures were present in 32.7% (n=17) and impending in 38.5% (n=20) of patients. The majority of lesions (63.5%, n=33) were metastatic.

RESULTS

Technical success, on an intent-to-embolize basis, defined as complete or near-complete stasis on post-embolization angiogram, was achieved in 88% of patients (51/58). Seven patients (4 men, 3 women, median age 17, age range 11-70) had preoperative angiograms but embolization was not attempted due to lack of a suitable embolic target. One patient underwent embolization on two separate occasions for different bone tumors. Embolic agents included tris-acryl microspheres (Embospheres) (n=26), PVA (n=20), coils (n=8), and gelfoam (n=10). Surgeries included resection, curettage, ORIF, and spinal decompression. Average estimated blood loss for all surgeries was 774.5 cc. Twelve patients required blood transfusion following surgery during hospitalization, with mean overall transfusion 0.5 units per patient. Three minor complications were attributed to angiography: groin hematoma, suspected contrast induced nephropathy, and arterial branch dissection/thrombosis.

CONCLUSION

Preoperative transarterial embolization is safe and effective in a wide variety of bone tumors prior to resection, ORIF, curettage, biopsy, and spinal decompression. A small minority of patients with bone lesions that appear hypervascular on cross-sectional imaging have vascular anatomy that is not amenable to embolization.

CLINICAL RELEVANCE/APPLICATION

Preoperative embolization of primary and metastatic bone tumors is feasible in most patients and safe. Here we report the largest retrospective case series in existing literature.

VSIO31-14 Role of Ablation is MSK Oligometastatic Disease

Tuesday, Nov. 29 4:55PM - 5:15PM Room: S405AB

Participants
Anil N. Kurup, MD, Rochester, MN, (kurup.anil@mayo.edu) (*Presenter*) Research Grant, Galil Medical Ltd; Royalties, UpToDate, Inc

LEARNING OBJECTIVES

1) Identify indications and contraindications for ablation of MSK tumors in the setting of oligometastatic disease. 2) Triage patients to ablation and particular ablation modalities based on tumor characteristics. 3) Recognize lesions that require adjunctive techniques, such as cementoplasty.

VSIO31-15 Developing an Electroporation and Nanoparticle-based Therapeutic Platform for Bone Metastases

Tuesday, Nov. 29 5:15PM - 5:25PM Room: S405AB

Participants
Alda L. Tam, MD, Houston, TX (*Presenter*) Medical Monitor, Galil Medical Ltd; Research Grant, AngioDynamics, Inc; Travel support, Geurbet SA; Advisory Board, Geurbet SA
Marites P. Melancon, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Tomas Appleton Figueira, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Li Tian, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Joe Ensor, Houston, TX (*Abstract Co-Author*) Consultant, Aetna, Inc
Kiersten Maldonado, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Katherine Dixon, RT, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Amanda McWatters, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Mark McArthur, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Sanjay Gupta, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To demonstrate the intratumoral uptake and antitumor effect of doxorubicin loaded superparamagnetic iron oxide nanoparticles (SPIO-DOX) when combined with irreversible electroporation (IRE).

METHOD AND MATERIALS

Fourteen rabbits with tibial VX2 tumors underwent one of three treatments: control (n=5); IRE (n=3); or injection of SPIO-DOX followed by IRE (SPIO-DOX+IRE) (n=6). Dynamic T2* weighted 4.7T MR images were obtained at t=0, 2 h, and 5 days after treatment to monitor the treatment effects mediated by SPIO-DOX. Elemental analysis was used to quantify iron concentration. Antitumor effect was expressed as a tumor growth ratio from T2* MR images and histological percent necrosis. A generalized linear model was used to analyze the data.

RESULTS

SPIO-DOX was clearly seen as a signal reduction in T2*-weighted images within the tumor up to 5 days after injection. Change in

T2* measurements show that there was a significant decrease in the signal intensity due to the presence of iron: 2.3 ms (control), 2.13 ms (IRE), and -8.94 ms (SPIO-DOX+IRE), $p < 0.0001$. Similarly, elemental analysis showed increased iron concentration in the tumor after SPIO-DOX: 30.8 ppm (control), 71.2 ppm (IRE), and 124 ppm (SPIO-DOX+IRE). Average volume of tumor prior to treatment was 157.3 + 46.5 mm3 and not significantly different between groups ($p=0.29$). Average tumor growth ratios were calculated: control (194.6 + 58%), IRE (135.9 + 13.7%), and SPIO-DOX+IRE (36.2 + 13.3%). While the difference between the average tumor growth ratio between the control and IRE groups was not significant ($p=0.15$), the group treated with SPIO-DOX+IRE shows a significant antitumor effect when compared to control ($p<0.0001$). Changes in tumor volume mirrored the histological calculation of percent necrosis: 59 + 20.4% (control), 65% (IRE), and 79.2 + 11.1% (SPIO-DOX+IRE). Percent necrosis was significantly different between the IRE and SPIO-DOX+IRE groups ($p=0.04$).

CONCLUSION

The intratumoral localization of SPIO-DOX can be successfully identified on MR imaging. Tibial VX2 tumors treated with combination therapy demonstrate enhanced antitumor effect when compared to control.

CLINICAL RELEVANCE/APPLICATION

Exploiting the synergy between electroporation and nanoparticle therapy is a viable strategy to surmounting the issue of incomplete tumor ablation in bone metastases.

VSIO31-16 Avoiding Complications with Ablation in the Spine

Tuesday, Nov. 29 5:25PM - 5:45PM Room: S405AB

Participants
Afshin Gangi, MD, PhD, Strasbourg, France, (gangi@unistra.fr) (*Presenter*) Proctor, Galil Medical Ltd

LEARNING OBJECTIVES

1/Describe the complications which could occur during spinal tumor ablation 2/ Describe how to avoid these complications and reduce the risks 3/ Describe the limits of thermal ablation of spine

VSIO31-17 Bone Metastases Tumor Board

Tuesday, Nov. 29 5:45PM - 6:00PM Room: S405AB

Participants
Sean M. Tutton, MD, Milwaukee, WI (*Moderator*) Consultant, Benvenue Medical, Inc

MSRO36

BOOST: Lung-Case-based Review (An Interactive Session)

Tuesday, Nov. 29 3:00PM - 4:15PM Room: S103CD

CH RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants
Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Moderator*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;
Jing Zeng, MD, Seattle, WA, (jzeng13@uw.edu) (*Presenter*) Nothing to Disclose
Jyoti D. Patel, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Ben J. Slotman, MD, PhD, Amsterdam, Netherlands, (bj.slotman@vumc.nl) (*Presenter*) Research Grant, Varian Medical Systems, Inc; Speakers Bureau, Varian Medical Systems, Inc;
Philip A. Linden, Cleveland, OH, (Philip.linden@uhhospitals.org) (*Presenter*) Nothing to Disclose
Gregory Kicska, MD, PhD, Seattle, WA, (kicskag@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the role of radiation therapy in management of lung cancer, and areas of controversy.

ABSTRACT

Active Handout:Ben J. Slotman

http://abstract.rsna.org/uploads/2016/16001275/Active MSRO36 Handout Slotman RSNA 2016.pdf

SSJ05

Chest (Functional)

Tuesday, Nov. 29 3:00PM - 4:00PM Room: S404CD

CH MR

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Hiroto Hatabu, MD, PhD, Boston, MA (*Moderator*) Research Grant, Toshiba Corporation; Research Grant, AZE, Ltd; Research Grant, Canon Inc; Research Grant, Konica Minolta Group
Katherine R. Birchard, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSJ05-01 Fourier Decomposition Based Non-Contrast Enhanced Functional Lung MRI for Quantitative Ventilation Assessment in Patients with Cystic Fibrosis

Tuesday, Nov. 29 3:00PM - 3:10PM Room: S404CD

Participants
Simon Veldhoen, MD, Wurzburg, Germany (*Presenter*) Nothing to Disclose
Andreas M. Weng, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Janine Knapp, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Kunz, MD, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Daniel Stab, St Lucia, Australia (*Abstract Co-Author*) Nothing to Disclose
Clemens Wirth, MD, Wuerzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Florian Segerer, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Helge Hebestreit, MD, Wuerzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Uwe Malzahn, PhD, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Herbert Koestler, PhD, Wuerzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Thorsten A. Bley, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the clinical feasibility of Fourier decomposition-based SENCEUL-MRI (SElf-gated Non-Contrast-Enhanced FUnctional Lung imaging) for quantitative ventilation imaging in patients with cystic fibrosis (CF).

METHOD AND MATERIALS

Following review board approval and informed consent of all participants, 20 CF patients and 20 matched healthy volunteers underwent Fourier decomposition-based MRI on a 1.5T scanner using the SENCEFUL approach, which utilizes a 2D-FLASH sequence with quasi-random sampling for data acquisition. The lungs were manually segmented from the ventilation-weighted images for automatic measurements of the quantitative ventilation (QV) indicated in ml gas per ml lung parenchyma per respiratory cycle (ml/ml). QV was compared for CF patients and volunteers and QV values of the CF patients were correlated to results of pulmonary function testing. Three radiologists rated the functional images for presence of ventilation deficits.

RESULTS

QV of the lungs was lower for CF patients (0.09 vs. 0.11 ml/ml, $p<0.01$, Figure 1). In accordance with the known predominate affection of upper parts of the lungs in CF, QV ratios of upper to lower lung quadrants were lower in CF patients expressing less ventilation of the upper parts (right, 0.84 vs. 1.16, $p<0.001$; left, 0.88 vs. 1.11, $p=0.02$). Accordingly, ventilation differences between the groups were larger in the upper quadrants (mean difference 0.04 ml/ml, $p<0.01$). Mean breathing frequency was significantly higher in CF patients with 20 respiratory cycles per minute vs. 16 in the controls ($p<0.01$). QV values of CF patients correlated with vital capacity ($r=0.7$, $p=0.01$), with residual volume (marker for static hyperinflation, $r=-0.8$, $p<0.01$) and with FEV1 (marker for airway obstruction, $r=0.7$, $p=0.02$). A pattern of widely distributed small ventilation deficits was found in 40% of the patient´s maps vs. 8% of the volunteers. Unimpaired ventilation was found in 28% vs. 67%, respectively ($p<0.001$).

CONCLUSION

SENCEFUL-MRI is feasible for contrast-free quantitative ventilation assessment. CF patients show less ventilation of upper lung parts and lower overall QV values, which correlate with vital capacity and with markers for hyperinflation and airway obstruction.

CLINICAL RELEVANCE/APPLICATION

Fourier decomposition-based SENCEFUL-MRI allows for site-resolved assessment of lung ventilation in cystic fibrosis without the necessity for contrast application or breath-holds.

SSJ05-02 Acinar Scale Relative Regional Air Volume Change Maps Reflecting Mechanics of LAAs in COPD Patients

Tuesday, Nov. 29 3:10PM - 3:20PM Room: S404CD

Participants
Kum Ju Chae, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Chang Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji Woong Choi, Iowa city, IA (*Abstract Co-Author*) Nothing to Disclose
Gong Yong Jin, MD, PhD, Jeonju, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Margaret Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

Ching-Long Lin, PhD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Eric A. Hoffman, PhD, Iowa City, IA (*Abstract Co-Author*) Founder, VIDA Diagnostics, Inc Shareholder, VIDA Diagnostics, Inc Advisory Board, Siemens AG
Hyun-Ju Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Low attenuation areas (LAAs) on CT scans have been used to evaluate emphysema and air trapping. However, the regional ventilation changes of LAAs while breathing may vary due to the various causes of emphysema or air trapping. Therefore, the purpose of this study was to investigate regional air volume change at acinar scale of the lung using mass preserving image registration technique and compare with the -950HUinsp, -856HUexp and PFTs in COPD.

METHOD AND MATERIALS

18 emphysema patients (12 centriacinar, 6 distal acinar emphysema) and 10 normal subjects were included in the study. VIDA Apollo software (Coralville, IA) and mass preserving image registration technique were used to compute relative regional air volume change (RRAVC) between inspiration and expiration CT scans. Then, low ventilation area (LVA) was defined as percent lung volume of RRAVC < 0.8. -950HUinsp, -856HUexp and LVA0.8 in total lung were correlated with FEV1, FEV1/FVC and compared between normal and emphysema patients.

RESULTS

LVA0.8 and -856HUexp showed positive correlation with FEV1 (r=-0.89 and p=0.016, r=-0.91, p=0.014) while -950HUinsp did not show a correlation with FEV1 in distal acinar emphysema patients. -950HUinsp and -856HUexp correlated well with FEV1/FVC in centriacinar emphysema (r=-0.61, p=0.036; r=-0.65, p=0.021). In the RRAVC map, LVA0.8 (colored blue) was well-matched with low attenuation (emphysema) regions, demonstrating decreased ventilation (air volume change) when compared with adjacent normal lung.

CONCLUSION

RRAVC map correlates well with FEV1 and demonstrates various ventilation patterns in the LAAs on CT in COPD and the proposed LVA0.8 may provide additional functional information at an acinar scale, supplementing LAAs in quantitative CT scans.

CLINICAL RELEVANCE/APPLICATION

Relative regional air volume change map using mass preserving registration technique may be useful for the explanation of different pathophysiology of the LAAs in COPD.

SSJ05-03 DCE-MRI versus 18F FDG PET/CT: Which is Better in Differentiation Between Malignant and Benign Solitary Pulmonary Nodules?

Tuesday, Nov. 29 3:20PM - 3:30PM Room: S404CD

Participants
Feng Feng, Nan Tong, China (*Presenter*) Nothing to Disclose
Peng Cao, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Ganlin Xia, nantong, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To prospectively compare the diagnosis efficacy of dynamic contrast enhanced-MRI (DCE-MRI) with that of PET/CT for differentiation between malignant and benign solitary pulmonary nodules (SPN). To find out the correlations between the quantitative MR pharmaeokinetic parameters including Ktrans, Kep, Ve, and PET/CT parameter maximum standardized uptake value (SUVmax).

METHOD AND MATERIALS

49 consecutive patients (29 males and 20 females; Age range: 44 -78 years; Mean value: 62 years) with SPNs were included in this prospective study. 32 SPNs were malignant, the other 17 were benign. All these patients underwent DCE-MRI and PET/CT. The quantitative MR pharmaeokinetic parameters including Ktrans, Kep, and Ve were calculated using Extended-Tofts Linear two-compartment model. SUVmax was also measured. Inter- and intraobserver agreement was analyzed by Bland and Altman plots. Metabolic and perfusion parameters of benign and malignant lesions were compared using the Mann–Whitney U test. The sensitivity, specificity for differentiating malignant from benign lung lesions were calculated for PET-CT and MRI parameters.ROC curve was used to find the optimal cut-off.

RESULTS

1.Good intra- and interobserver reproducibility was obtained for Ktrans, Kep, Ve and SUVmax. 2.There were significant differences between malignant and benign nodules in Ktrans, kep (P <0.05). There was a statistic difference between malignant and benign nodules in SUVmax (P <0.05). There were no significant differences between malignant and benign nodules in Ve (P >0.05).3. The AUC of Ktrans, Kep, and SUVmax between malignant and benign nodules were 0.909, 0.838, and 0.759, respectively. The sensitivity of these parameters were 90.6%, 87.5%, and 75.0% and specificity were 82.4%, 76.5%, and 70.6% for the differential diagnosis of solitary pulmonary nodule if taken the maximum Youden's index as cut-off.There were no significant differences of AUC between Ktrans and SUVmax, as well as Kep and SUVmax for differential diagnosis of solitary pulmonary nodule (P>0.05).

CONCLUSION

The sensitivity and specificity of Ktrans and kep in diagnostic performance for the differentiation of malignant from benign nodules were higher than those of SUVmax but had no significant difference between them.

CLINICAL RELEVANCE/APPLICATION

MRI has the following advantages over FDG-PET:(1) no radiation; (2)less time; (3)economic.

SSJ05-04 Time-Resolved Hyperpolarised Xenon Lung Imaging (HP 129Xe-MRI) for Evaluation of Collateral Ventilation in Chronic Obstructive Pulmonary Disease (COPD)

Tuesday, Nov. 29 3:30PM - 3:40PM Room: S404CD

Awards
Student Travel Stipend Award

Participants
Tahreema N. Matin, MBBS, Oxford, United Kingdom (*Presenter*) Nothing to Disclose
Mitchell Chen, DPhil,MBBS, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ozkan Doganay, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Xiaojun Xu, MSc, DPhil, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics
Tom Doel, DPhil, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Najib Rahman, MSc, DPhil, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Vicente Grau, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Annabel Nickol, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Fergus V. Gleeson, MBBS, Oxford, United Kingdom (*Abstract Co-Author*) Consultant, Alliance Medical Limited Consultant, Blue Earth Diagnostics Limited Consultant, Polarean, Inc

PURPOSE

To demonstrate the feasibility of time-resolved hyperpolarised xenon lung imaging (HP 129Xe-MRI) for evaluation of delayed and collateral ventilation in patients with chronic obstructive pulmonary disease (COPD).

METHOD AND MATERIALS

Fourteen patients with COPD (stage II – IV GOLD criteria classification) underwent HP 129Xe-MRI at 1.5T, combined nuclear medicine ventilation and computed tomography (NM-V SPECT/CT) at a single time point.Time-resolved HP 129Xe-MRI involved repeat acquisition of coronal image slices at 3-second intervals up to five times during a single breath-hold. In house software was used to quantify the ventilation level per pulmonary lobe at each time point. Delayed ventilation (DV) was defined increased ventilation in a lobe showing ventilation defects at baseline. Corresponding co-registered coronal image slices acquired with NM-V SPECT/CT were reviewed for any discernable differences that may contribute to collateral ventilation. Interlobar fissure completeness was evaluated on CT by the presence of >90% fissure in at least one plane.The McNemar's test was used to determine the association between CT predicted collateral ventilation from fissure integrity and observed HP 129Xe-MR DV in each lobe.

RESULTS

DV was demonstrated in 13 of the 14 patients involving a total of 42 pulmonary lobes. No differences in pulmonary parenchyma were visible on CT between lobes that did and did not show DV. Furthermore, DV demonstrated with HP 129Xe-MRI was not observed on co-registered NM-V image slices. There was a statistically significant association between CT predicted collateral ventilation from fissure integrity and HP 129Xe-MRI delayed ventilation in the left upper and lower lobes ($\chi 2$ =6.13, p=0.01 and $\chi 2$ =6.13, p=0.01).

CONCLUSION

Time-resolved breath-hold HP 129Xe-MR ventilation imaging is a feasible technique to demonstrate DV in patients with COPD. Future work may confirm that the observed DV represents collateral ventilation and subsequently identify a potential role for HP 129Xe-MRI to improve patient selection for regional treatments including lung volume reduction surgery and endobronchial valve placement.

CLINICAL RELEVANCE/APPLICATION

Delayed ventilation detection with HP 129Xe-MRI is superior to NM-V SPECT/CT detection. It may be of clinical value in patients considered for lung volume reduction therapy.

SSJ05-05 Application of Image Registration Based Local Displacement Measurement (Lung Motionography) for the Assessment of Lung Fibrosis

Tuesday, Nov. 29 3:40PM - 3:50PM Room: S404CD

Participants
Jiwoong Choi, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Chang Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kum Ju Chae, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Gong Yong Jin, MD, PhD, Jeonju, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ching-Long Lin, PhD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Eric A. Hoffman, PhD, Iowa City, IA (*Abstract Co-Author*) Founder, VIDA Diagnostics, Inc Shareholder, VIDA Diagnostics, Inc Advisory Board, Siemens AG
Hyun-Ju Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Elastography has been used for the assessment of fibrosis in the liver and breast. However, ultrasonography is not easy to be applied for the fibrosis in the lung parenchyma due to the air. In this study, we applied image registration based local displacement information from expiration to inspiration to grade the degree of fibrosis in the idiopathic interstitial lung disease such as usual interstitial pneumonia and nonspecific interstitial pneumonia.

METHOD AND MATERIALS

10 normal and 18 idiopathic interstitial lung disease (13 IPF and 5 NSIP) subjects were included in our study. VIDA Apollo software (Coralville, Iowa) and mass preserving image registration technique were used to compute displacement vectors of local lung regions at an acinar scale. Three-dimensional displacements and dorsal basal displacements were normalized by the cubic root of global lung volume change from expiration to inspiration CT scans. Displacements and volume changes in the upper and lower lobes and the whole lung are compared between three groups using analysis of variance test (ANOVA).

RESULTS

IPF and NSIP were not differentiated by volume changes of the whole lung or upper and lower lobes, whereas lower lobe air volume change were smaller in both IPF and NSIP than normal subjects (p=0.02, p=0.001). In the whole lung, dorsal basal displacement was smaller in ILD and normal subjects (p=0.035), while three-dimensional displacement was not different between the groups. Three-dimensional and dorsal basal displacement was smaller in the lower lobes of IPF subjects than NSIP (p=0.044) and normal (p=0.006) subjects.

CONCLUSION

Lung motionography using image registration based dorsal basal displacement in the lower lobe may be used for the understanding of the structure-function relationships in fibrotic lung disease.

CLINICAL RELEVANCE/APPLICATION

Image registration based local displacement information may help us to assess the degree of lung fibrosis and to make a diagnosis in the fibrotic lung disease.

SSJ05-06 Deep Convolutional Neural Network Approaches in Making a Diagnosis with Chest Radiographs: Initial Experience

Tuesday, Nov. 29 3:50PM - 4:00PM Room: S404CD

Participants
Chang Min Park, MD, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jong Hyuk Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Anthony S. Paek, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) CEO, Lunit Inc
Sangheum Hwang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, Lunit Inc
Meejin Cho, MD,JD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, Lunit Inc
Su Suk Oh, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Chest radiograph (CR) is the first-line and most common method for the diagnosis of pulmonary diseases. The purpose of this study was to develop a deep convolutional neural network model for the purposes of making a diagnosis with CRs and to evaluate its diagnostic performance in 102,885 CRs.

METHOD AND MATERIALS

From 2010 to 2015, 102,885 CRs were taken at our hospital in 24,105 individuals which were then subcategorized into normal and abnormal CRs based on radiologists' reports (37,247 normal CRs from 4,572 individuals (M:F=1,831:2,741; mean age, 53.3years) and 65,638 abnormal CRs from 19,533 individuals (M:F=11,127:8,406; mean age, 58.6years)). Abnormal CRs were those in which lung diseases such as pneumonia, emphysema, diffuse interstitial lung disease, tuberculosis, lung cancer, and pulmonary metastasis were present. All CRs were randomly divided into group 1 (27,224 normal and 55,638 abnormal), group 2 (5,021 normal and 4,995 abnormal), and group 3 (5,002 normal and 5,005 abnormal). Thereafter, a diagnostic model based on a deep convolutional neural network was developed using a 25-layer deep residual network and trained with the group 1 dataset, validated through the group 2 dataset, and tested for diagnostic performance using the group 3 dataset. The diagnostic performance of the model was evaluated using receiver-operating characteristics (ROC) curve analysis.

RESULTS

In the validation dataset, the trained deep neural network model showed an area under the ROC curve (AUC) of 0.944, with an accuracy, sensitivity and specificity of 86.6%, 87.8% and 85.4%, respectively. When tested with the group 3 dataset, the AUC of the established algorithm was 0.948 (accuracy, 88.0%; sensitivity, 88.8%; specificity, 87.2%). When specificity was set at 99% and 95%, the algorithm showed sensitivities of 60.1% and 79.6%, respectively. There were no significant differences in the diagnostic performance of the trained model between the validation setting and the test setting (p=0.165).

CONCLUSION

A data-driven diagnostic model based on a deep neural network demonstrated high diagnostic performance in differentiating normal from abnormal CR findings.

CLINICAL RELEVANCE/APPLICATION

A diagnostic system based on a deep convolutional neural network has high diagnostic performance in differentiating normal and abnormal CRs, and thus helps radiologists read CRs with high accuracy.

MSES34

Essentials of Chest Imaging

Tuesday, Nov. 29 3:30PM - 5:00PM Room: S100AB

CH

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

Participants

Sub-Events

MSES34A Sarcoidosis: Case-based Review

Participants
H. Page McAdams, MD, Durham, NC, (page.mcadams@duke.edu) (*Presenter*) Research Grant, General Electric Company; Consultant, MedQIA Imaging Core Laboratory ; Author, Reed Elsevier; Author, UpToDate, Inc; Research Consultant, F. Hoffmann-La Roche Ltd; Research Consultant, Boehringer-Ingelheim GmbH

LEARNING OBJECTIVES

1) Discuss classic clinical and radiologic features of thoracic sarcoidosis. 2) Discuss less common or less well known aspects of thoracic sarcoidosis including pulmonary hypertension, airway obstruction and drug-induced sarcoidosis. 3) Discuss the role of FDG-PET imaging in the diagnosis and management of thoracic sarcoidosis.

ABSTRACT

Sarcoidosis is a multisytem granulomatous disease of unknown etiology. This presentation will first brifefly review the most common radiologic manifestions of thoracic sarcoidosis. Then, less common or less well known aspects of thoracic sarcoidosis will be discussed, including pulmonary hypertension, airway obstruction and drug-induced sarcoidosis. Finally, the role of FDG-PET imaging for diagnosis and management of thoracic sarcoidosis will be discussed.

Active Handout:H. Page McAdams

http://abstract.rsna.org/uploads/2016/16000882/MSES34A Sarcoidosis RSNA 2016 McAdams Handout.pdf

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/

H. Page McAdams, MD - 2012 Honored Educator

MSES34B Patterns of Lymphadenopathy in Common Thoracic Malignancies

Participants
Juliana M. Bueno, MD, Chicago, IL, (julianab@uchicago.edu julianab@uchicago.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review clinically relevant pathways of lymphatic dissemination of common thoracic malignancies, including lung cancer, breast cancer and esophageal carcinoma. 2) Learn potential pitfalls in nodal staging of lung cancer and their impact in the patient's prognosis. 3) Learn key clinically relevant information to be included in staging reporting of these three common malignancies.

ABSTRACT

Medical imaging plays an essential role in the primary diagnosis and staging of neoplastic disease and in the selection of the most appropriate site for tissue biopsy. As such, it is one of the main components of the post treatment assessment in oncologic patients.In thoracic imaging, nodal staging is an important piece of information that directly impacts the prognosis of patients and therefore deserves careful assessment and an appreciation of the pathways of lymphatic dissemination in specific malignancies. Appropriate nodal staging will directly impact the prognosis and survival of oncologic patients. Knowledge of the most common pathways of lymphatic drainage and dissemination of disease in the chest, as well as the importance of specific nodal stations in the overall oncologic staging of the patient, will allow the radiologist to perform an accurate and detailed assessment. Including clinically relevant information in the report assists in deciding upon the most appropriate treatment option.

Active Handout:Juliana Marcela Bueno

http://abstract.rsna.org/uploads/2016/16000881/ACTIVE MSES34B.pdf

MSES34C Imaging Techniques and Diagnostic Strategies in Pulmonary Embolism

Participants
Carole A. Ridge, MD, Dublin 7, Ireland (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

This lecture will illustrate contemporary technical strategies to improve CT pulmonary angiography image quality and radiation dose and clinical strategies to facilitate the accurate diagnosis of pulmonary embolism and its complications.

ABSTRACT

200 CTPA's are performed every hour on emergency department patients in the US. This educational presentation aims to ensure that radiologists are familiar with key techniques to ensure accurate pulmonary embolism imaging, dose reduction, and diagnosis, with particular attention to underdiagnosis and overdiagnosis.

MSES34D Imaging of Patients with Hemoptysis

Participants
Diana Litmanovich, MD, Haifa, Israel, (dlitmano@bidmc.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The lecture will focus on airways related benign and malignant causes of hemoptysis. 2) Systemic approach to hemoptysis as a symptom will be discussed, including cause, source, and consequences. 3) Specific attention will be paid to ACR appropriateness criteria in assessment of hemoptysis. 4) Advantages and disadvantages of currently available imaging modalities will be discussed. 5) Optimal protocols for MDCT evaluation with emphasis on radiation dose reduction will be reviewed, including imaging of the airways, pulmonary vasculature and lung parenchyma.

ABSTRACT

RC401

RSNA Diagnosis Live™: High Resolution CT of Diffuse Lung Disease: Read Cases with the Experts (An Interactive Session)

Tuesday, Nov. 29 4:30PM - 6:00PM Room: E450A

CH CT

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

Participants

Georgeann McGuinness, MD, New York, NY (*Moderator*) Nothing to Disclose
Daria Manos, MD, FRCPC, Halifax, NS, (daria.manos@nshealth.ca) (*Presenter*) Speakers Bureau, F. Hoffmann-La Roche Ltd
Brett M. Elicker, MD, San Francisco, CA, (brett.elicker@ucsf.edu) (*Presenter*) Nothing to Disclose
Sharyn L. MacDonald, MBChB, Christchurch, New Zealand (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the applications and limitations of HRCT in detecting and characterizing diffuse lung disease through the review and discussion of cases. 2) Apply correct usage of the HRCT lexicon to specific findings, to better elucidate pathophysiology and to refine differential considerations. 3) Develop diagnosis and management algorithms by working through problematic cases with the expert discussants.

ABSTRACT

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Active Handout:Daria Manos

http://abstract.rsna.org/uploads/2016/14000784/ACTIVE RC401manos handouts.pdf

Active Handout:Sharyn Leigh Shirley MacDonald

http://abstract.rsna.org/uploads/2016/14000784/RC401 MacDonald S handout F.pdf

Active Handout:Brett M. Elicker

http://abstract.rsna.org/uploads/2016/14000784/RSNA2016.pdf

ED003-WE

Chest Wednesday Case of the Day

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

CH

AMA PRA Category 1 Credit ™: .50

Participants

Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
Paola J. Orausclio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Joaquina Paz Lopez Moras, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Danielle H. Carpenter, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Kimberly G. Kallianos, MD, San Franicsco, CA (*Abstract Co-Author*) Nothing to Disclose
Graham M. Wallace, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Bram Geurts, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC
Agustina Agnetti, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lekshmi Santhosh, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) To analyze interesting chest cases. 2) To understand appropriate differential diagnosis. 3) To understand the clinical significance of the diagnosis presented.

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/

Santiago E. Rossi, MD - 2015 Honored Educator
Travis S. Henry, MD - 2016 Honored Educator

SPDL40

RSNA Diagnosis Live™: Keeping Radiology Weird-Spot Diagnoses from the Pacific Northwest

Wednesday, Nov. 30 7:15AM - 8:15AM Room: E451B

CA CH MK NR

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Cristina Fuss, MD, Portland, OR (*Presenter*) Nothing to Disclose
Bryan R. Foster, MD, Portland, OR (*Presenter*) Nothing to Disclose
Brooke R. Beckett, MD, Portland, OR, (becketbr@ohsu.edu) (*Presenter*) Nothing to Disclose
David R. Pettersson, MD, Portland, OR (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

URL

RC501

Practical Issues in Thoracic Imaging (An Interactive Session)

Wednesday, Nov. 30 8:30AM - 10:00AM Room: N228

CH

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

Participants
Matthew D. Gilman, MD, Boston, MA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the anatomic considerations of the more common ICU tubes and lines. 2) Recognize the proper positioning and malpositions of the more common ICU tubes and lines. 3) Understand the techniques of VA and VV ECMO and the implications for imaging.

ABSTRACT

Critical care patients often require invasive support and monitoring devices to support life and direct clinical management decisions. These tubes and lines are among the most common urgent findings in the imaging of the ICU patient. This presentation will illustrate the anatomy, proper positioning, and malpositions of the more common tubes and lines with illustrations and examples. Newer support devices (ECMO) and the potential pitfalls in imaging these patients will also be illustrated.

Sub-Events

RC501A Managing the Indeterminate Lung Nodule

Participants
Claudio Silva Fuente-Alba, MD , Santiago, Chile, (csilvafa@alemana.cl) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Present a systematic approach to the incidental indeterminate lung nodule. 2) Provide insight on the incremental value of the classic features that suggest malignancy/benignity. 3) Provide evidence-based information on the strengths and weakness of the available diagnostic procedures following detection. 4) Review current follow-up recomendations for solid and subsolid incidental nodules.

ABSTRACT

With increasing number of chest CT performed for various clinical scenarios, the number of incidental nodules detected have grown exponentially. It is the radiologist's role to be able to limit further follow-up studies only to those nodules that may be in an indeterminate status. In this lecture, we will review the imaging findings that are classically associated with benignity and malignancy, and to discuss the current recommendations for follow-up and/or additional studies in incidental solid and subsolid lung nodules.

RC501B Imaging of the ICU Patient: Tubes and Lines

Participants
Matthew D. Gilman, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the anatomic considerations of the more common ICU tubes and lines. 2) Recognize the proper positioning and malpositions of the more common ICU tubes and lines. 3) Understand the techniques of VA and VV ECMO and the implications for imaging.

RC501C Incidental Findings at Thoracic Imaging

Participants
Carol C. Wu, MD, Houston, TX, (ccwu1@mdanderson.org) (*Presenter*) Author, Reed Elsevier

LEARNING OBJECTIVES

1) Understand the prevalence and significance of incidental thoracic imaging findings. 2) Recognize appropriate, evidence-based management or follow-up recommendations for incidental thoracic imaging findings.

ABSTRACT

With increasing utilization of chest CT and PET-CT for lung cancer screening and oncologic evaluation, radiologists often encounter incidental thoracic imaging findings. Some of these incidental findings such as pulmonary emboli may require prompt communication with referring clinicians. Other findings such as thyroid nodules, pulmonary nodules or anterior mediastinal masses may require further imaging work-up. The purpose of this presentation is to discuss the prevalance, clinical significance and management recommendations for these incidental findings.

RC501D 'No Touch' Thoracic Interventional Lesions

Participants

Joseph G. Mammarappallil, MD, PhD, Durham, NC (*Presenter*) Nothing to Disclose

SSK05

Chest (Vascular/Interventional)

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S404CD

CH VA CT IR MR

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

Participants
Jonathan H. Chung, MD, Chicago, IL (*Moderator*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
David F. Yankelevitz, MD, New York, NY (*Moderator*) Royalties, General Electric Company

Sub-Events

SSK05-01 Prospective Randomized Comparison of High-Pitch CT under Free Breathing with Standard-Pitch CT under Breath Hold for Detection of Pulmonary Embolism

Participants
Katharina Martini, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Andreas A. Meier, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Kai Higashigaito, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Natalia Saltybaeva, PhD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Thomas Frauenfelder, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To prospectively compare high pitch computed tomography (HPCT) under free breathing (FB) with standard pitch CT (SPCT) under breath-hold (BH) for the detection of pulmonary embolism (PE).

METHOD AND MATERIALS

In this IRB-approved prospective study, 100 consecutive patients (47 females, 53 males; mean age 58.7±16.6) randomly underwent HPCT under FB (n=50) or SPCT under BH (n=50). Radiation doses were documented for all scans. One reader measured mean pulmonary artery attenuation, noise; mean signal to noise ratio (SNR) was calculated. Two independent readers assessed overall image quality (5-point Likert scale), diagnostic confidence for detection or exclusion of PE, motion artifacts, assessability of anatomical structures, and presence of transient interruption of contrast as sign of Valsalva maneuver. Inter-reader agreement was calculated.

RESULTS

Radiation dose was significantly lower in HPCT as compared to SPCT (6.01±2.26 mGy vs. 2.68±0.60; p<0.001). Mean pulmonary artery attenuation and image noise were significantly higher in HPCT (attenuation: 479HU vs. 343, p<0.001; noise: 16HU vs. 10HU, p<0.001) whereas SNR was similar between groups (34HU vs. 38HU; p=0.258). Images of both groups were of diagnostic quality. HPCT showed to have significantly higher diagnostic confidence for detection of PE (p=0.048), less cardiac and breathing artifacts (p<0.001) and better assessability of anatomical structures (p<0,001) compared to the SPCT group. Additionally, there were significantly less cases showing Valsalva maneuver/transient interruption of contrast in the HPCT group compared to the SPCT group (p<0.001).

CONCLUSION

HPCT under free breathing allows for a significant reduction of breathing and cardiac motion artifacts compared to SPCT under breath hold. Diagnostic confidence and assessability of vascular and bronchial structures as well as SNR were maintained.

CLINICAL RELEVANCE/APPLICATION

HPCT allows for significant reduction of motion artifacts, transient interruption of contrast and provides high diagnostic confidence despite patients do not need to follow breathing instructions

SSK05-02 C-Arm Computed Tomography Adds Diagnostic Information in Patients with Chronic Thromboembolic Pulmonary Hypertension and a Positive V/Q SPECT

Wednesday, Nov. 30 10:40AM - 10:50AM Room: S404CD

Participants
Jan Hinrichs, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas Werncke, MD, Dipl Phys, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Till F. Kaireit, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Marius Hoeper, Hannover, Germany (*Abstract Co-Author*) Consultant, Actelion Ltd; Consultant, Bayer AG; Consultant, GlaxoSmithKline plc; Consultant, Pfizer Inc
Karen Olsson, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank K. Wacker, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Pro Medicus Limited; Research Grant, Delcath Systems, Inc;
Frank M. Bengel, MD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Lantheus Medical Imaging, Inc; Research Grant, General Electric Company; Research Grant, Bracco Group; Consultant, Lantheus Medical Imaging, Inc; Advisory Board, General Electric Company; Speaker, General Electric Company; Speaker, Siemens AG ; Speaker, Bayer AG
Christian Von Falck, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Pro Medicus Limited Research Grant, Siemens AG
Imke Schatka, Berlin, Germany (*Abstract Co-Author*) Nothing to Disclose
Bernhard C. Meyer, Hannover, Germany (*Presenter*) Research Consultant, Pro Medicus Limited

PURPOSE

To determine if C-Arm computed tomography (CACT) has added diagnostic value in patients suffering from chronic thromboembolic pulmonary hypertension (CTEPH) with a positive mismatch pattern in V/Q single photon emission computed tomography (SPECT).

METHOD AND MATERIALS

Twenty-eight patients (23 men, 62±18y) with CTEPH who had undergone SPECT, followed by CACT and right heart catheterization (RHC) were included. Patients with combined V/Q defects were excluded. Two independent readers reviewed SPECT and CACT. CTEPH-indicating findings and their location (segmental or sub-segmental) were identified (V/Q mismatch in SPECT and vascular pathologies in CACT). Inter-modality agreement was calculated (Cohen´s Kappa). Findings were scored on a 3-point-scale. The sum of the score (pulmonary artery CTEPH severity score (PACSS)) was calculated for each patient and imaging modality, correlated to RHC (spearman rho) and compared to the final therapeutic decision of the CETPH board (including the consensus of SPECT, selective pulmonary DSA and CACT).

RESULTS

Overall, 504 pulmonary artery segments were assessed in SPECT and CACT. SPECT had identified 266/504 (53%) arterial segments without and 238/504 (47%) with pathologic V/Q mismatch. CACT detected 131/504 (26%) segments without pathologic findings and 373/504 (74%) with pathologic findings. Inter-modality agreement for V/Q mismatch in SPECT vs. pathology on CACT was fair (κ=0.38). Median PACSS based on SPECT V/Q mismatch was 10 [7.75/13.5; 25/75 quartile], compared to a median PACSS of 15 [13.75/17] in CACT (p=0.01). PACSS of CACT correlated mildly significant with mean pulmonary artery pressure (R=0.47, p=0.01), whereas SPECT missed significance (R=0.3, p=0.12). Discrepant findings were mostly attributed to a higher frequency of sub-segmental pulmonary arterial pathologies on CACT (145 sub-segmental pathologic findings) rated as normal on SPECT.

CONCLUSION

In patients with CTEPH, contrast-enhanced CACT is of additional value for a more precise morphological assessment of distal pulmonary arteries. CACT indicates abnormalities even in segments without V/Q abnormalities.

CLINICAL RELEVANCE/APPLICATION

SPECT perfusion scanning underestimates the extent of pulmonary vascular lesions and thus disease severity in comparison to CACT with potentially high clinical impact in case of missed diagnosis of CTEPH.

SSK05-03 Noncontrast Lung Perfusion Imaging with Arterial Spin Labeling MRI

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S404CD

Awards
Student Travel Stipend Award

Participants
Christopher Maroules, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Josh Greer, BS, Rowlett, TX (*Abstract Co-Author*) Nothing to Disclose
Ananth J. Madhuranthakam, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Ivan Pedrosa, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Kelly Chin, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Fernando Torres, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
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
Ronald M. Peshock, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Few studies have evaluated lung perfusion imaging with noncontrast arterial spin labeling (ASL) magnetic resonance imaging (MRI). We sought to evaluate the feasibility of ASL MRI at 3 Tesla in healthy volunteers and patients with pulmonary vascular disease.

METHOD AND MATERIALS

The study consisted of 10 healthy volunteers and 10 patients with pulmonary arterial hypertension (PAH), mean age 42 years. All subjects underwent lung perfusion MRI at 3 Tesla, including 2-dimensional (2D) flow alternating inversion recovery with an extra radiofrequency pulse (2D ASL-FAIRER). 2D phase contrast imaging of the pulmonary arteries was performed to measure pulmonary artery flow. A subgroup (n=10) underwent repeat 2D ASL-FAIRER on the same day for evaluation of test-retest reproducibility. Regional perfusion was quantified using an established perfusion equation. Relative dispersion (standard deviation of image intensity divided by the mean) was measured to assess heterogeneity in pulmonary perfusion. Inter-observer and test-retest reproducibility were evaluated using the Bland-Altman method. Spearmann correlation was used to evaluate associations between regional perfusion and pulmonary artery flow. The Wilcoxon signed-rank test was used to compare relative dispersion between healthy volunteers and patients with PAH.

RESULTS

2D ASL-FAIRER regional lung perfusion in all subjects was within the normal range of 400-600 mL/100g/min. Regional perfusion by 2D ASL-FAIRER demonstrated high inter-observer reproducibility (-45 ± 120 mL/100g/min) and moderate test-retest reproducibility (62 ± 252 mL/100g/min). There was good correlation between perfusion in the right lower lobe and pulmonary artery flow (r=0.72, p=0.02), and weaker correlation between perfusion in the right upper lobe and pulmonary artery flow (r=0.49, p=0.03). The relative dispersion of lung perfusion was higher in patients with PAH compared to healthy volunteers (1.25 ± 0.41 vs 0.93 ± 0.32, p=0.06), but this difference did not reach statistical significance.

CONCLUSION

Noncontrast 2D ASL-FAIRER measurement of regional lung perfusion at 3 Tesla is feasible and demonstrates good reproducibility. ASL-derived regional lung perfusion correlates with phase contrast pulmonary artery flow.

CLINICAL RELEVANCE/APPLICATION

Regional lung perfusion imaging with noncontrast ASL at 3 Tesla is a feasible technique and may provide new quantitative

biomarkers for evaluating pulmonary vascular disease.

Honored Educators

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Suhny Abbara, MD - 2014 Honored Educator

SSK05-04 Comparison of Unhanced and Contrast Enhanced MRI of the Pulmonary Vasculature in the Detection of Pulmonary AV-Malformations (PAVM) in Patients with Hereditary Hemorrhagic Telangiectasia (HHT / Osler's Disease)

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S404CD

Participants
Philippe Jagoda, MD, Homburg/Saar, Germany (*Presenter*) Nothing to Disclose
Jonas Stroeder, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Alexander Massmann, MD, Homburg/Saar, Germany (*Abstract Co-Author*) Nothing to Disclose
Arno Buecker, MD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group; Speaker, Bracco Group; Consultant, Medtronic plc; Speaker, Medtronic plc; Research Grant, Novartis AG; Research Grant, GlaxoSmithKline plc; Research Grant, Biotest AG; Research Grant, OncoGenex Pharmaceuticals, Inc; Research Grant, Bristol-Myers Squibb Company; Research Grant, Eli Lilly & Company ; Research Grant, Pfizer Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, sanofi-aventis Group; Research Grant, Merrimack Pharmaceuticals, Inc; Research Grant, Sirtex Medical Ltd; Research Grant, Concordia Healthcare Corp; Research Grant, AbbVie Inc; Research Grant, Takeda Pharmaceutical Company Limited ; Research Grant, Merck & Co, Inc; Research Grant, Affimed NV; Research Grant, Bayer AG; Research Grant, Johnson & Johnson; Research Grant, Seattle Genetics, Inc; Research Grant, Onyx Pharmaceuticals, Inc; Research Grant, Synta Pharmaceuticals Corp; Research Grant, Siemens AG; Research Grant, iSYMED GmbH; Research Grant, St. Jude Medical, Inc; Co-founder, Aachen Resonance GmbH;
Guenther K. Schneider, MD, PhD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group;

PURPOSE

Since PAVMs are a common finding in HHT patients and paradoxical thromboembolism may result in significant morbidity and mortality due to cerebral strokes or abscess formations, a safe and reliable method to detect these AV malformations is needed to allow for early minimal invasive treatment by catheter embolization. MRI of the pulmonary vessels can be considered a preferable method for this purpose, since no x-ray or iodinated contrast agents are needed. The aim of our study was to compare Gd-enhanced MRA with unenhanced MR imaging technique of the pulmonary vasculature in detection of PAVMs.

METHOD AND MATERIALS

62 patients with HHT underwent 100 MR examinations between 2011 and 2015. During each examination a non contrast enhanced SPACE (3D TSE-sequence/ TR 4.733 ms/ TE 101 ms/ FLIP 150°) and a contrast enhanced 3D GRE MRI sequence (TR 2,87ms/ TE 1,07 ms/ FLIP 25°, 0.1 mmol/kg BW MultiHance) were acquired. Both examinations were read by two experienced radiologists and the number of detected AV-Malformations was reported in mutual agreement for each examination. The contrast enhanced images were read first and after a blanking interval of 6 weeks, the SPACE was read by the same radiologists; blinded to the results of the first reading. In those patients that underwent interventional treatment, catheter angiography and in all other patients CE-MRA served as the gold standard. A paired t-test was utilized for statistical evaluation.

RESULTS

1 Examination was excluded due to respiratory artifacts in both sequences. 18 AV-malformations requiring therapy were reported in 16 patients. Using contrast enhanced images, an overall significantly higher number of AV-malformations was detected (60 vs. 41, $p<0.001$) but none of the AV-malformations requiring therapy were missed using the unenhanced SPACE sequence.

CONCLUSION

Clinical relevant PAVMs in HHT patients can be identified using a non-contrast enhanced SPACE sequence, thus allowing for imaging especially in pediatric patients or pregnant patients without the need of contrast injection. However, small PAVMs are missed and thus to rule out even small PAVMs in adult patients, CE-MRA should be performed.

CLINICAL RELEVANCE/APPLICATION

The detection of clinical relevant pulmonary AV-malformations can be safely performed in patients with contraindications for i.v. contrast medium (e.g. pregnancy) by using a SPACE sequence.

SSK05-05 Preoperative CT-guided Microcoil Localization Facilitates Lung Parenchymal Sparing Surgery in Patients at High Risk for Development of New Primary Lung Cancers with Local Recurrence Rates Comparable to Lobectomy

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S404CD

Awards
Student Travel Stipend Award

Participants
Carol Donagh, MBBCh, Vancouver, BC (*Presenter*) Nothing to Disclose
Richard Finley, MD, West Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Joanne Clifton, MS, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
John English, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Stephen Lam, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
John R. Mayo, MD, Vancouver, BC (*Abstract Co-Author*) Speaker, Siemens AG

PURPOSE

Lung cancer screening programs increase the detection of early T1 non-small cell lung cancers in high risk patients. After resection, these patients often develop new primary lung cancers requiring further surgery. Historically, unguided wedge resections of T1 non-small cell lung cancers recur locally in up to 30% of patients. We hypothesized that pre-operative localization of these nodules using percutaneous CT guided microcoil localization (CTML) followed by fluoroscopic guided VATS wedge resection would provide clean resection margins with low local recurrence rates while preserving lung parenchyma facilitating future localized resections of new primary tumours

METHOD AND MATERIALS

CTML and VATS wedge resection of NSLC was performed in 106 patients (59 women){median 64 (34-81) years}. Serial chest CTs (6-12 month postoperative intervals) and were reviewed by 2 chest radiologists for local, local/regional and distant cancer recurrences and new primaries. Median follow-up was 82 (32-136) months.

RESULTS

Resections after CTML were 53 diagnostic/therapeutic wedge (D/TW) alone or 53 diagnostic wedges followed by therapeutic lobectomy (DW/TL). The groups were matched for histopathology and stage at surgery. There was no significant 90-day morbidity or mortality. The overall recurrence rate was 13.2%. 3% developed recurrence at the resection margin, 2% locoregional disease in the ipsilateral lung or mediastinum and 8.4% metastatic disease. There were no statistical differences in recurrence rate or type between the coil group and lobectomy group. 17 patients (16%) patients developed new primary lung tumors in the follow up period.

CONCLUSION

CTML of small primary lung cancers followed by fluoroscopic guided VATS wedge resection preserves lung parenchyma and has a low recurrence rate, comparable to diagnostic wedge and lobectomy. This spares lung parenchyma in a patient group with high risk of new lung primary malignancy.

CLINICAL RELEVANCE/APPLICATION

CTML should be considered for surgical management of T1 lung cancer to preserve lung parenchyma and facilitate future surgical treatment of new primary lung cancer.

SSK05-06 Experience with a Tract Sealant System for Percutaneous CT-Guided Lung Nodule Biopsies in an Oncology Population

Wednesday, Nov. 30 11:20AM - 11:30AM Room: S404CD

Participants
Patricia M. de Groot, MD, Houston, TX (*Presenter*) Nothing to Disclose
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Judy U. Ahrar, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Bradley S. Sabloff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Cesar Moran, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jeremy J. Erasmus, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Sanjay Gupta, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Garrett M. Gladish, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Gregory W. Gladish, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Joe Y. Chang, MD, PhD, Housotn, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Tract sealants are being used more frequently to reduce pneumothoraces and chest tube placement in patients undergoing lung biopsy. These tracts can be visible on follow-up imaging and can mimic the appearance of malignant tract seeding. The purpose of our study was to characterize these tracts and determine the likelihood of malignant seeding.

METHOD AND MATERIALS

Over a 15 month period 407 lung biopsies were performed using a BioSentry Tract Sealant System; 321 cases had follow up CT studies. 4 chest radiologists retrospectively analyzed imaging to determine the incidence, appearance, temporal relationship and evolution of biopsy tracts. Tracts that decreased or did not change on follow-up were considered benign. 10 surgically resected cases were retrospectively examined by a pathologist for malignant tract seeding.

RESULTS

321 cases were analyzed. 237 (74%) had a visible biopsy tract on CT (95%CI 0.69, 0.78) (primary lung cancer n=90, metastases n=81, benign nodule n=66). All tracts were identified on 1st follow-up imaging at 1-3 months post-biopsy. Tracts were typically serpiginous and smooth or lobulated with a thickness of 2-5 mm.218/237 (92%) tracts were unchanged over time (mean follow up, 12 months). 15/237 (6.3%) decreased in thickness. Unchanged or decreasing tracts were considered negative for malignant seeding. Increase in tract thickness or nodularity occurred in 4/237 (1.7%), suspicious for malignant tract seeding. 0/90 (0%) biopsy tracts in primary lung cancer showed progressive increase. 4/81 (4.9%) tracts in patients with metastases showed increase (mean, 99 days post-biopsy). 10 resected nodules/tracts (5 primary NSCLCs, 5 metastases) had no malignant seeding at histology.

CONCLUSION

A biopsy tract on CT is common after lung biopsy using the BioSentry device. Malignant seeding of the biopsy tract occurred only after biopsy of metastases from extrathoracic primary malignancies and manifested as a progressive increase in tract thickness. Further studies are needed to assess whether the use of this new device increases the frequency of tract seeding in this patient group.

CLINICAL RELEVANCE/APPLICATION

Tracts from biopsy of primary lung cancers using the BioSentry device had no malignant seeding and they should have no impact

tracts from biopsy of primary lung cancers using the BioSentry device had no malignant seeding and this should have no impact on surgical resection or localized radiation therapy. Patients undergoing lung biopsy for metastasis had a higher than expected rate of tract increase suspicious for seeding, requiring further investigation.

Honored Educators

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Jeremy J. Erasmus, MD - 2015 Honored Educator

SSK05-07 Utility of 3.0 T MRI for Dynamical and Long-term Observation in the Ablated Zone of Lung Nodule Postcryotherapy-A Pilot Study

Wednesday, Nov. 30 11:30AM - 11:40AM Room: S404CD

Participants
Jing Li, Zhengzhou, China (*Presenter*) Nothing to Disclose
Hailiang Li, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess Magnetic Resonance Imaging (MRI) features after percutaneous cryotherapy for malignant lung nodules.

METHOD AND MATERIALS

A prospective IRB-approved analysis of 26 patients who underwent percutaneous cryoablation treatment for malignant lung nodule was included in this study. All procedures were performed using general anesthesia and CT guidance. Unenhanced and dynamic contrast-enhanced MRI scans were obtained at precryoablation and 1-day, 1-week, 1-, 3-, 6- and 12-month postcryoablation. Two radiologists independently and double-blindly reviewed MRI images, signal intensity of the ablated zone on both T1WI and T2WI were evaluated by a 5-point grading scale. The changing characters of nodule volume, signal intensity on T1WI and T2WI over time were summarized. Tumor volume and time-signal intensity curves of the nodule at each time point was also recorded.

RESULTS

(1)Scores of signal intensity on T1WI and T2WI by two observers showed good consistency, Kappa coefficient was 0.872,0.856. (2)The mean volume at each time point were 15.15,99.64,72.50,32.19,11.49,7.81and 5.86 cm3. (3) The ablated zone showed heterogeneous signal intensity on T1WI and T2WI at 1-day postcryoablation, signal intensity increased at 1-week on T1WI and 1-month on T2WI postcryoablation, then decreased at 3-month and remain the same at 6-and 12-month postcryoablation. (4)The ablation zone showed no definite enhancement at 1-day, 1-week and 1-month and mild delayed enhancement at 3-, 6- and 12-month postcryoablation. (5)Cavitations occurred in 34.6% (9/26) cases and gradually resolved.(6)Four patients (17.4%,4/23) had progression in the ablation zone, none of the patients had needle tract metastasis.

CONCLUSION

Patients who underwent cryotherapy for lung nodules treatment had characteristic changes on follow-up MRI, including: the volume of the nodule increased at 1-day, 1-week and 1-month ,then gradually decreased. The signal intensity on T1WI and T2WI increased heterogeneously from 1-day to 1-month and continually decreased to homogeneous muscle-like level. Absence of a complete hypo-intense rim at 1-week and 1-month and cavitations at 1-month postcryoablation were suggestive of tumor progression. One week to 3-month postcryoablation was an important time period to observe significant change of the ablated zone.

CLINICAL RELEVANCE/APPLICATION

MRI is valuable in identifying the ablated zone and can reflect its evolution with time.

SSK05-08 Incidence and Risk Factors of Delayed Pneumothorax after Percutaneous Transthoracic Needle Biopsy (PTNB) under Cone-Beam CT (CBCT) Guidance in 4308 Patients

Wednesday, Nov. 30 11:40AM - 11:50AM Room: S404CD

Awards
Student Travel Stipend Award

Participants
Woo Hyeon Lim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Chang Min Park, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soon Ho Yoon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun-Ju Lim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jong Hyuk Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the incidence, risk factors and clinical significance of delayed pneumothorax after cone-beam CT (CBCT)-guided percutaneous transthoracic needle biopsy (PTNB) in 4308 consecutive patients.

METHOD AND MATERIALS

From January 2009 to November 2015, 4308 consecutive patients (2575 men and 1733 women; mean age 63.4 ± 12.3 years-old) underwent 4692 CBCT-guided PTNBs for lung lesions (mean target size, 3.2 ± 2.0 cm). Delayed pneumothorax was defined as pneumothorax that was not detected on immediate post-procedural CT scan, but found on follow-up chest radiographs. The incidence and risk factors of delayed pneumothorax after PTNBs and those of chest drainage tube insertion due to delayed pneumothorax were investigated.

RESULTS

Among 4692 PTNBs, delayed pneumothorax occurred in 284 procedures (6.1%). Target location, size, emphysema, pleura to target distance, pleural passage number, needle indwelling time, and biopsy-needle size were significantly associated with the occurrence of delayed pneumothorax according to univariate analysis. Subsequent multivariate analysis revealed that upper/middle lobe location (odds ratio [OR]=1.342; C.I, 1.032 – 1.746), smaller target size (OR=0.840 ; C.I, 0.772 - 0.913), presence of emphysema (OR=2.324; C.I, 1.554 - 3.475), deeply located target (OR=1.175; C.I, 1.100 - 1.255), longer needle indwelling time (OR=1.047; C.I, 1.016 - 1.078), and use of smaller biopsy-needles (20-22G) (OR=0.524; C.I, 0.361 - 0.761) were significant risk factors for delayed pneumothorax. Sex, age, and pleural passage number were not significantly associated with the occurrence of delayed pneumothorax.In addition, among the 284 patients with delayed pneumothorax, 27 patients underwent chest tube insertion due to delayed pneumothorax (9.5%). Only emphysema was found to be a significant risk factor for the placement of a chest drainage tube (OR=4.089; C.I, 1.677 - 9.970).

CONCLUSION

The incidence of delayed pneumothorax was 6.1% (284 of 4692) among all PTNBs of which 9.5% (27 of 284) underwent chest tube drainage procedures. Significant risk factors for delayed pneumothorax include emphysema, smaller target size, deeper location and longer needle indwelling time.

CLINICAL RELEVANCE/APPLICATION

Awareness of the significant risk factors for the occurrence of delayed pneumothorax and subsequent chest tube insertions can help in the screening and management of patients at high risk.

SSK05-09 Image Guided Percutaneous Pleural Biopsy Diagnostic Yield and Accuracy for Benign and Malignant Pleural Lesions

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S404CD

Participants
Joao R. Inacio, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Bann Saffar, MBChB,FRANZCR, Perth, Australia (*Abstract Co-Author*) Nothing to Disclose
Chantale Belanger, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Ashish Gupta, MD, Ottawa, ON (*Abstract Co-Author*) Grant, Medtronic plc
Carolina A. Souza, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Jean M. Seely, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Carole J. Dennie, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Primary goal was to determine the diagnostic yield, accuracy and complications of imaging-guided percutaneous biopsy of pleural lesions. Secondary goal was to assess technique and pleural lesion variables that correlate with accurate final diagnosis.

METHOD AND MATERIALS

A retrospective study was conducted between 2002 and 2013, and among 548 pleural biopsies performed at a single academic centre, 108/548 (19.7%) biopsies were performed under image guidance. A total of 108 biopsies were performed in 86 patients under computed tomography (CT) (n=53), ultrasound (US)(n=38) or fluoroscopy (n=17) guidance. Clinical data, pleural lesion imaging features, biopsy technique, complications and final diagnosis were reviewed. Yield and accuracy were calculated per modality and benign and malignant pleural lesions.

RESULTS

Pleural biopsies (fine needle aspirate and/or core) were adequate for final diagnosis in 74/86 (86%). Rate of repeat biopsy was 20% (17/86). Thoracoscopy or thoracotomy was required for final diagnosis in 12/86 (14%). Final diagnoses included malignancy (n=72) or suspected malignancy (n=3) in 87% and benign lesions (n=9) or negative for malignancy (n=1) in 12%. Of the 108 biopsies, 4% had complications (2 pneumothorax, 1 hydropneumothorax and 1 needle-tract seeding). Pleural lesion size was lower ($p<0.05$) for CT guided group (17±13mm), compared to US (31±21mm) or fluoroscopy (35±18mm), and diffuse linear or nodular pleural thickening was more frequent in the CT 41/53 (79%) and fluoroscopy 11/17(65%) compared to US 10/38 (26%) group ($p<0.05$). For diagnosing benign pleural disease, pleural biopsy sensitivity was 100%, specificity 94.7 and accuracy 95.3%. For malignant pleural disease, sensitivity was 91.9, specificity 90.9% and accuracy 91.8%. Overall, imaging-guided pleural biopsy had 92.9% sensitivity, 94.2% specificity and 93.5% accuracy.

CONCLUSION

Image-guided pleural biopsy has high diagnostic yield and accuracy for both malignant and benign lesions, with low complication rates.

CLINICAL RELEVANCE/APPLICATION

Image guided pleural biopsy is a safe procedure with high diagnostic yield and accuracy.In a selected population with confident pleural lesion imaging identification, image guided percutaneous pleural biopsy should be considered for pleural pathology diagnosis in alternative to thoracoscopy or surgical pleural biopsy.

SSK18

Radiation Oncology (Lung)

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S104A

CH RO OI

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

Participants
Meng X. Welliver, MD, Columbus, OH (*Moderator*) Nothing to Disclose
Matthew M. Harkenrider, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSK18-01 A Comparison of Chemoradiotherapy Regimens used for Elderly Patients with Stage III Non-Small Cell Lung Cancer in the US

Awards
Student Travel Stipend Award

Participants
Jeremy P. Harris, MD , Stanford, CA (*Presenter*) Nothing to Disclose
Manali Patel, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Billy W. Loo JR, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research support, Varian Medical Systems, Inc; Research support, RaySearch Laboratories AB; Board Member, TibaRay, Inc
Heather Wakelee, MD, Stanford, CA (*Abstract Co-Author*) Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Eli Lilly and Company; Research Grant, Exelixis, Inc; Research Grant, Novartis AG; Research Grant, Pfizer Inc; Research Grant, Celgene Corporation; Research Grant, AstraZeneca PLC; Research Grant, Regeneron Pharmaceuticals, Inc; Research Grant, Clovis Oncology, Inc; Research Grant, Gilead Sciences, Inc; Research Grant, Xcovery; Research Grant, Bristol-Myers Squibb Company; Research Consultant, Peregrine Pharmaceuticals, Inc; Research Consultant, ACEA Biosciences, Inc; Research Consultant, Pfizer Inc; Research Consultant, Helsinn Healthcare SA;
Maximilian Diehn, MD, PhD, San Carlos, CA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd; Consultant, Quanticel Pharmaceuticals Inc; Research Grant, Varian Medical Systems, Inc

PURPOSE

The standard of care for patients with unresectable stage III non-small cell lung cancer (NSCLC) is definitive radiation with concurrent chemotherapy. For these patients, consolidation chemotherapy is frequently given, although several randomized trials have failed to show a benefit. We explored the association of consolidation chemotherapy with outcomes using a population-based comparative effectiveness approach.

METHOD AND MATERIALS

Surveillance, Epidemiology, and End Results (SEER)-Medicare was used to identify patients aged ≥65, diagnosed 2002-2009, and treated with definitive radiation. We identified the various platinum-based doublet chemotherapy agents used. Chemoradiotherapy regimens were given as either sequential, concurrent only, concurrent with induction, or concurrent with consolidation. Outcomes were overall survival (OS) and cancer specific survival (CSS). Survival was estimated using the Kaplan-Meier method, with comparisons being made using log-rank tests, Cox proportional hazards models, and Royston-Parmar flexible parametric models.

RESULTS

2,006 patients were identified. Median OS was 18 months, with 1- and 2-year survival estimates of 68% (66-70%) and 39% (37-41%). The majority of patients (97%) received carboplatin-paclitaxel/docetaxel/gemcitabine/etoposide or cisplatin-etoposide. The use of consolidation chemotherapy was associated with improved OS and CSS compared to concurrent chemotherapy alone, with a multivariate adjusted OS HR of 0.82 ($p = 0.0098$) and CSS HR of 0.82 ($p = 0.03$). Propensity score adjusted analyses demonstrated similar results. In subset analyses, the benefit of consolidation chemotherapy was found only for patients treated with carboplatin-based doublets and not with cisplatin-etoposide.

CONCLUSION

For elderly patients in the US with NSCLC being treated with definitive concurrent chemoradiation, we found that patients receiving cisplatin during radiation do not appear to benefit from additional chemotherapy. However, for patients receiving carboplatin, consolidation chemotherapy appears to result in improved survival.

CLINICAL RELEVANCE/APPLICATION

For elderly patients with stage III non-small cell lung cancer treated with concurrent chemotherapy and radiation, additional consolidation chemotherapy should be given when carboplatin is used.

SSK18-02 What are Recurrence Patterns in Patients with Malignant Pleural Mesothelioma Treated with IMRT after Lung-sparing Pleurectomy/Decortication?

Wednesday, Nov. 30 10:40AM - 10:50AM Room: S104A

Participants
Micheal H. Raj, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Darragh Halpenny, MBBCh, MRCPI, New York, NY (*Presenter*) Nothing to Disclose
Andreas Rimner, MD, New York, NY (*Abstract Co-Author*) Research Consultant, General Electric Company Research Consultant, Varian Medical Systems, Inc Research Grant, Varian Medical Systems, Inc
Michelle S. Ginsberg, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to asses patterns of recurrence in patients with malignant pleural mesothelioma (MPM) treated with hemithoracic pleural intensity-modulated radiation therapy (IMRT) after lung-sparing pleurectomy/decortication.

METHOD AND MATERIALS

The institutional review board approved this study. Consecutive patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT between February 21, 2005 and December 1, 2015 were included. Only patients who had chest CTs pre and post IMRT were included and imaging was retrospectively reviewed by two radiologists in consensus. Features assessed included: presence or development of single or multiple pleural or parenchymal nodules or consolidation, focal or diffuse pleural thickening, pleural effusion, chest wall mass or peritoneal disease.

RESULTS

Fifty patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT were included. The MPM subtypes on histology included: 41 epithelioid (82%), 2 sarcomatoid (4%), and 7 biphasic (14%). 25 patients (50%) had residual disease after surgery on the baseline CT prior to IMRT. 39 patients (78%) had recurrent disease on CT: 21 local, 13 distant and 5 local and distant.Of the 26 patients with local recurrence, the most common CT appearance of pleural recurrence were new/ increased focal mass or pleural thickening, nodular pleural thickening or multiple new pleural nodules. In the 25 patients without local recurrence, the most common appearance included stable or decreased pleural thickening or new/increased diffuse smooth pleural thickening. In the 18 patients with distal recurrence, the most common sites were in the lung parenchyma or peritoneum.

CONCLUSION

In patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT local recurrence presented as new/increased focal pleural mass/thickening, diffuse nodular pleural thickening, or multiple pleural nodules. The most common sites for distant recurrence were lung parenchyma and peritoneum.

CLINICAL RELEVANCE/APPLICATION

Familiarity with the patterns of recurrence on CT in patients with MPM treated with IMRT is important in the follow up of these patients.

SSK18-03 Prognostic Potential of CBCT for Tracking Tumor Regression in Stage II-III Non-Small Cell Lung Cancer

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S104A

Awards
Student Travel Stipend Award

Participants
Kylie Kang, BS, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): During external beam radiation therapy (EBRT) of lung cancer, cone beam computed tomography (CBCT) is routinely performed for image guidance. This study was conducted in order to determine the prognostic potential of CBCT for evaluating treatment outcome in terms of GTV reduction and to determine the difference of tumor reduction based on different histology. Materials/Methods: Forty-one NSCLC patients treated with definitive radiotherapy at one institution who received daily CBCT were randomly selected. Patients received mean EBRT of 60.7 Gy (range: 50-71.4 Gy) at 1.8 or 2 Gy per fraction. Initial mean gross tumor volume (GTV) was 197.3 cc (range: 3.4-1815.0 cc). Six sets of CBCT at an interval of one week were chosen, starting from the first fraction of treatment. The CBCTs were transferred to MIM Software (v.6.0) and single physician manually contoured the GTV on each slice. The change in GTV was recorded. Patient's clinical information was obtained from the institution electronic medical record. All statistical analysis was conducted on MedCalc (v.16.2). Univariate survival analysis was done using the Kaplan-Meier method with log-rank test. Median overall GTV reduction was used as a cutoff value (DGTVDGTV=45%). A univariate regression analysis was done to explore the correlation between histology and GTV reduction. A pResults: A consistent regression of GTVs was observed in 29 patients, while 12 patients experienced an increase of GTV at some point during their EBRT. Maximum reductions occurred during week 1 and 2 week of radiation, with mean % reductions of 13.5% and 12.6%, respectively. There was an overall GTV % reduction between weeks 1 to 6 in all 41 patients (median: 45%). The recurrence free survival (RFS) in our stratified group with DGTVDGTV=45% was 24.3 months (SE: 4.6) (p= 0.61). Overall survival (OS) for the group of patients with DGTVDGTV=45% (p= 0.21). There was a 6.6% greater overall GTV reduction in adenocarcinoma versus SCC on univariate regression analysis (p= 0.31). There was no statistical significance between histology and RFS (p=0.84) or OS (p=0.06).Conclusion: Large regression of GTV over the course of EBRT for stage II-III NSCLC patients was observed, however, no correlation was found with clinical outcome (RFS, OS). There was slightly higher GTV reduction in adenocarcinoma as compared to SCC, but no statistical significance. A future study with larger sample size involving multivariable analysis is warranted.VariablesMean/Median/CountSD/Range/%Median Age (y)6244-80Gender (#) Female/Male27/1465.9%/34.1Week 1 GTV (cc) Mean197.33.4-1815 Median68.93.4-1815Follow-Up (months) Median12.41.9-61.3

SSK18-05 Prognostic Value of Pretreatment PET Parameters in Stereotactic Ablative Radiotherapy (SABR) for Metastatic Non-Small Cell Lung Cancer

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S104A

Awards
Trainee Research Prize - Resident

Participants
Alexander L. Chin, MD, MBA, Stanford, CA (*Presenter*) Nothing to Disclose
Kiran A. Kumar, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Henry Guo, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Peter G. Maxim, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maximilian Diehn, MD, PhD, San Carlos, CA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd; Consultant, Quanticel Pharmaceuticals Inc; Research Grant, Varian Medical Systems, Inc

Billy W. Loo JR, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research support, Varian Medical Systems, Inc; Research support, RaySearch Laboratories AB; Board Member, TibaRay, Inc
Michael Gensheimer, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Increasing interest exists in the use of stereotactic ablative radiotherapy (SABR) for treatment of patients with oligometastatic non-small cell lung cancer (NSCLC). Factors influencing outcomes after SABR for metastatic NSCLC are still unclear. We hypothesized that metabolic burden of disease on FDG PET at time of SABR can serve as a biomarker of survival outcome.Materials/Methods: Patients with metastatic NSCLC who received SABR, defined as total BED10 of =50 Gy delivered in =8 fractions, to one or more lesions were identified. All patients underwent FDG PET within 30 days prior to start of radiotherapy (RT). Patients with untreated brain metastases or who received either RT to the brain or non-SABR RT to any site within 2 weeks of SABR treatment were excluded from the analysis. Metabolic tumor volume (MTV) and total lesion glycolysis (TLG) were measured on pretreatment PET separately for treated and untreated lesions using a gradient-based method. Cox regression was used to assess the influence of imaging and clinical factors on overall survival (OS).Results: 59 treatment courses in 44 patients qualified for analysis, with median number of lesions treated of 1 (range 1 to 6) and median BED10 of 87.5 Gy (range 50.4 to 180 Gy). 66% (n=39) of treatment courses involved oligometastatic disease, defined as =5 total metastatic lesions. The most commonly treated sites were primary tumor (n=18), bone (n=17), and lung metastasis (n=14). With a median follow-up of 13.6 months, there were 4 local failures (7%). Median progression-free survival (PFS) and OS were 6.6 and 28.6 months, respectively. On univariate Cox regression, factors predictive of OS were MTV of untreated lesions (hazard ratio [HR] 1.024 for a 1 mL increase in MTV; p=0.003), TLG of untreated lesions (HR 1.003 for a 1 unit increase in TLG; p=0.008), MTV of all lesions (HR 1.012; p=0.02), and TLG of all lesions (HR 1.002; p=0.03). Three of the four factors (total MTV, untreated lesion MTV, and untreated lesion TLG) remained significant on multivariate regression controlling for age and performance status. MTV and TLG of treated lesions did not predict OS or PFS. Furthermore, the presence/absence of active untreated lesions was not a significant predictor of OS (p=0.755).Conclusion: In a cohort of metastatic NSCLC patients with primarily oligometastatic disease treated with SABR, metabolic tumor burden on FDG PET was predictive of overall survival after treatment. Pretreatment PET parameters may serve as a useful biomarker to select patients most suitable for aggressive local treatment with SABR.

SSK18-06 Long-term Outcomes of Stereotactic Body Radiotherapy for Stage I Non-small Cell Lung Cancer using Different Doses Depending on Tumor Size: Re-evaluation by Superposition-Comparable Dose Calculation Algorithms

Wednesday, Nov. 30 11:20AM - 11:30AM Room: S104A

Participants
Fumiya Baba, MD, Nagoya, Japan (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): In stereotactic body radiotherapy (SBRT) for stage I non-small cell lung cancer (NSCLC), it was found that the outcomes of stage IB patients were worse than those of stage IA patients when treated with the same dose. We have performed SBRT since 2004 using different prescribed doses depending on tumor size. The clinical outcomes treated with our protocol are herein reported. In addition, radiation doses were re-evaluated by the algorithm comparable to the superposition method.Materials/Methods: Between February 2004 and November 2008, 124 patients with stage I NSCLC underwent SBRT; 87 had stage IA and 37 had stage IB disease. Total doses of 44, 48, and 52 Gy were administered to the isocenter for tumors with a longest diameter of 3 cm, respectively. All doses were delivered in 4 fractions twice a week. Pencil beam convolution with Batho power law correction (PBC-BPL) was used as the dose calculation algorithm. These plans were recalculated by anisotropic analytical algorithm (AAA) with the same monitor units.Results: The median follow-up period for living patients was 69 months (range: 24 to 124). For all 124 patients, overall survival (OS) was 55%, cause-specific survival (CSS) was 75%, progression-free survival (PFS) was 61%, and local control (LC) was 80%, at 5 years. The 5-year OS was 58% for 85 stage IA patients treated with 48 Gy and 49% for 37 stage IB patients treated with 52 Gy (p = 0.16). At 5 years, CSS was 76% versus 73% (p = 0.45), PFS was 60% versus 56% (p = 0.31), and LC was 83% versus 73% (p = 0.21). At 5 years, the cumulative incidence of grade 2 or 3 radiation pneumonitis (RP) was 15% for all patients; it was 9% in stage IA patients and 29% in stage IB patients (p=0.0086). Median doses to the isocenter recalculated using AAA were 47.58 Gy (range: 42.70-48.59) in 48 Gy prescription, and 51.54 Gy (range: 49.28-52.34) in 52 Gy prescription. Median PTV D95 doses of PBC-BPL plans were 45.79 Gy (range: 38.64-47.28) in 48 Gy prescription, and 49.35 Gy (range: 41.76-50.39) in 52 Gy prescription. Median recalculated PTV D95 doses of AAA plans were 42.00 Gy (range: 34.03-44.99), and 46.16 Gy (range: 40.64-48.71) in the two prescriptions, respectively. There were significant differences between PBC-BPL plans and AAA plans both in the isocenter dose and the PTV D95.Conclusion: In our protocol, there were no significant differences in OS, CSS, PFS and LC between stage IA and IB tumors despite the difference in tumor size. On the other hand, there was a significant difference in RP incidence. In the revised protocol, dose was prescribed at the PTV D95 using superposition-comparable dose calculation algorithms, taking these results into account.

SSK18-07 Image-Guided Hypofractionated Proton Therapy in the Management of Centrally Located Early Stage NSCLC

Wednesday, Nov. 30 11:30AM - 11:40AM Room: S104A

Participants
Bradford Hoppe, MD, Jacksonville , FL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Stereotactic body radiotherapy (SBRT) has proven to be an excellent way to manage patients with small and peripheral early-stage non-small cell lung cancer (NSCLC). Unfortunately, concern exists regarding the management of early-stage centrally located NSCLC with SBRT because of reports of toxicity. We investigated outcomes from delivering hypofractionated proton therapy (PT) among patients with centrally located stage I NSCLC.Materials/Methods: From 2009 through 2015, 16 patients were treated for medically inoperable centrally located de novo (n=12) or relapsed (n=4) stage I NSCLC (IA, n=5; IB, n=11) with image-guided hypofractionated PT on an IRB-approved outcomes tracking protocol (median age, 69 years). Centrally located tumors were those within 2 cm of the proximal bronchial tree or heart. Patients underwent 4D CT simulation following fiducial marker placement and an iGTV was contoured per the 10 phases of the scan (median, 15.5 cc; range 6-56 cc). Initially, a 5-mm margin was added to make an ITV but was eliminated in 2014, followed by a 5-mm margin for the PTV (median, 78.5cc; range 32-211cc). Daily image-guidance was done using fiducial markers and double exposure of orthogonal kv imaging at the peaks of inspiration and expiration. Patients were all treated with 60 Gy(RBE) (6 Gy[RBE]/fraction x 10 fractions) utilizing pre-defined dose

constraints. Patients were evaluated by a physician and assessed for CTCAEv4 toxicities weekly during treatment, at 1 month after treatment, then every 3 months for 2 years, and then every 6 months until 5 years with a CT or PET/CT. Overall survival, progression-free survival, local control, regional control, and control of distant metastases were evaluated using the Kaplan-Meier method. Results: Median follow-up for the cohort was 44 months (range, 4-67). The 3-year progression-free survival and overall survival rates were 41% and 84%. The median progression-free and overall survival were 28 and 60 months. The 3-year local (ipsilateral lobe), regional, and distant control rates were 89%, 77%, and 74%. Four patients died with disease and 1 from complications of pneumonia 52 months after treatment. Seven patients developed a recurrence, including 5 distant, 3 regional, and 1 in the ipsilateral lobe at the edge of the treatment field. Five received salvage radiation for the recurrences using either SBRT (n=2) or standard fractionated proton therapy +/- chemo (n=3). Three have had no evidence of disease for >1.5 years.Within 6 months of treatment 6 patients (38%) experienced respiratory symptoms (cough, fatigue, shortness of breath) that resolved with antibiotics and/or a short course of steroids. One grade 3 toxicity occurred in a patient who developed a bronchial stricture (PTV, 211cc) requiring hospitalization and stent. Conclusion: Image-guided hypofractionated PT for centrally located stage I NSCLC provides promising local control and long-term survival with acceptable toxicity. Regional nodes and distant relapses remain a problem.

SSK18-08 The First Report to Evaluate Clinical Outcome of Dynamic Tumor-Tracking Stereoactic Body Radiotherapy for Early Stage Lung Cancer and Oligometastatic Lung Tumors Using a Gimbal-Mounted Linear Accelerator

Wednesday, Nov. 30 11:40AM - 11:50AM Room: S104A

Participants
Takamasa Mitsuyoshi, Kyoto, Japan (*Presenter*) Nothing to Disclose
Yukinori Matsuo, MD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Mitsuhiro Nakamura, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Kenji Takayama, MD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaki Kokubo, MD, Kobe, Japan (*Abstract Co-Author*) Research Consultant, Mitsubishi Corporation
Takashi Mizowaki, MD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masahiro Hiraoka, MD, PhD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Recently, stereotactic body radiotherapy (SBRT) has developed as a new treatment modality for early stage lung cancer or oligometastatic lung tumor. When a lung tumor is treated with SBRT, the whole trajectory of a moving tumor is included in the irradiation field. It means healthy tissues are irradiated and leads to increase risks of toxicities. So, we hypothesized that dynamic tumor-tracking (DTT) SBRT using a gimbal-mounted linear accelerator could reduce irradiated volumes of healthy tissues and risks of toxicities without reducing tumor local control (LC) rate. This is the first reported study to evaluate clinical outcomes of DTT-SBRT using a gimbal-mounted linear accelerator.Materials/Methods: Eligibility criteria were as follows: (1) a single lung tumor with a diameter of 50 mm or less, (2) no metastasis, (3) respiratory tumor movement of 10 mm or more, (4) age of 20 years or above, (5) performance status (PS) of 0–2. Prior to the treatment, gold markers were placed under bronchoscopic guidance around the tumors as an internal surrogate for the tumor position. The tumors and markers were monitored with the kV imagers during irradiation in real-time. Out of 47 patients whom markers had been injected in, 29 patients (62%) were treated by DTT-SBRT successfully between September 2011 and April 2015 in Kyoto University Hospital or Institute of Biomedical Research and Innovation and had been enrolled in this study. The dose fraction schedule was 48 Gy/4 fr for clinical stage 1A lung cancer, and 56Gy Gy/4 fr for clinical stage 1B lung cancer and oligometastatic lung tumors. The prescribed dose was defined at the isocenter. The patients characteristics were as follows: median age, 78 years (range, 58–88); male/female: 22/7; PS 0/1/2: 9/16/4; primary lung cancer/oligometastatic lung tumor: 24/5; clinical stage T1a/T1b/T2a: 12/8/4 (UICC-7). Toxicity grading was scored using the Common Terminology Criteria for Adverse Events v.4.0. The survival rates were calculated using the Kaplan-Meier methods.Results: The median follow-up time was 23.4 months (range, 0.2–49.2). The 2-year overall survival (OS), progression free survival (PFS) and LC rate was 72%, 58% and 87%, respectively. Local recurrence developed in 4 patients and distant metastasis developed in 5 patients. At the time of analysis, 21 patients were alive and 8 patients had died. Out of living patients, 4 patients had recurrence. Out of dead patients, 4 patients died from progressive disease. Univariate analysis (log-rank test) could not help to identify the factor for worse OS or PFS. Grade 2 or worse toxicities were occurred in 2 patients (6.9%). One had Grade 2 radiation pneumonitis and the other had Grade 3 radiation pneumonitis.Conclusion: DTT-SBRT using a gimbal-mounted linear for patients with early stage lung cancer and oligometastatic lung tumors resulted in good LC with acceptable toxicities.

SSK18-09 Stereotactic Ablative Body Radiation (SABR) for Stage I Lung Cancer: A Retrospective Single Institution Report

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S104A

Participants
Sarit Appel, ramat gan, Israel (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Stereotactic Ablative Radiation Therapy (SABR) is the new standard of care in medically inoperable stage I lung cancer and has been advocated for use as an alternative to surgery in patients with operable stage I lung cancer. Prior to beginning a pilot study for use of SBRT in operable stage I Iung cancer, we reviewed and report local control, survival and toxicities of SABR in Stage I lung cancer in tertiary single institution since its introduction in 2009.Materials/Methods: A retrospective database analysis of stage I lung cancer treated with SBRT from 2009-2015. Database included: gender, age, histology, stage, radiation dose and fractionation and treatment dates. Survival status was confirmed from the national registry. Local failure was defined as increased FDG uptake on PET-CT scan within a 2 cm radius of the treated region. Survival and local control were dated from first day of radiation and censored at last visit or at event. Toxicity was graded according to common toxicity criteria adverse events (CTCAE) v. 4.03. Statistical methods used were Kaplan-Meier and Cox regression for survival analysis.Results: A total of 114 patients were treated for 122 stage I lung cancer lesions over the study period. Median follow up time was 27 months (range 8.2-69.5 months), median age was 76 (range 40-96). Stage IA was in 82% of the lesions, adenocarcinoma was in 45%, no biopsy was in 19.7%. The prescribed dose to encompass the PTV was 50 Gy/5fx in 68%, 54 Gy/3fx in 14.5% and 60Gy/8fx in 11.5%. The calculated BED was at least 100 Gy in 94.3% of treated lesions.Median survival was 46 months, estimated 3 years overall survival was 59% (95% CI 47-69%). For stage IA and IB, median survival was 51.3 and 41.4 months respectively (NS). Three years local control was 88% (95% CI 78-94%). On Cox regression, the survival and local control were not significantly affected by histology or fractionation. Toxicity was mild and included chest wall pain in 8.4% patients, rib fracture in 0.9%, grade 1-2 pneumonitis in 12%, grade 3 pneumonitis in 12% and grade 5 in 0.9%. Sixteen central lesions were treated with 8-10 fractions without occurrence of

airway necrosis or hemoptysis.Conclusion: SABR has been successfully implemented at our institution for the treatment of stage I lung cancer in inoperable patients with excellent local control, low toxicity and acceptable overall survival. A prospective study evaluating SBRT as an alternative to surgery in operable patients with stage I lung cancer will be proposed.

CHS-WEA

Chest Wednesday Poster Discussions

Wednesday, Nov. 30 12:15PM - 12:45PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Smita Patel, MBBS,FRCR, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

CH265-SD-WEA1 Pleural Invasion/adhesion of Subpleural Lung Cancer: Quantitative 4-dimensional CT Analysis Using Dynamic-ventilatory Scanning

Station #1

Participants
Kotaro Sakuma, MD, Fukushima, Japan (*Presenter*) Nothing to Disclose
Tsuneo Yamashiro, MD, Nishihara, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation
Hiroshi Moriya, MD, Fukushima-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Sadayuki Murayama, MD, PhD, Nishihara-Cho, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation

PURPOSE

Using 4-dimensional dynamic-ventilatory scanning provided by a 320-row computed tomography (CT) scanner, we aimed to assess pleural invasion and adhesion of peripheral (subpleural) lung cancer quantitatively.

METHOD AND MATERIALS

Sixteen patients with subpleural lung cancer underwent dynamic-ventilation CT during free breathing. No pleural invasion or adhesion was surgically confirmed in 10 patients subsequently, while the other six patients were judged to have pleural invasion or adhesion. Using research software, we tracked the movements of the cancer center and the adjacent structures every 0.35 seconds and converted the data to 3-dimensional loci. The following quantitative indices were obtained and compared by Mann-Whitney test: the ratio of the total movement distance of each (cancer/adjacent structures), the cross-correlation coefficient between time curves for the movement distances of the cancer and the adjacent structures, and the cosine similarity between the inspiratory and expiratory vectors (from the cancer to the adjacent structures).

RESULTS

Generally, the movements of the loci of the lung cancer and the adjacent structures were similar in patients with pleural invasion and adhesion, while they were independent in patients without. There were significant differences in all parameters between the two patient groups (movement ratio and cross-correlation coefficient, $P < 0.01$; cosine similarity, $P < 0.05$).

CONCLUSION

Dynamic-ventilation CT can be utilized as a novel imaging approach to preoperative analysis of pleural invasion and adhesion.

CLINICAL RELEVANCE/APPLICATION

This study is the first to demonstrate a quantitative 4-dimensional analysis of peripheral lung cancer and the potential for an accurate preoperative diagnosis of pleural invasion and adhesion.

CH266-SD-WEA2 Quantitative CT Texture Analysis for the Distinction of Invasive Adenocarcinoma From Adenocarcinoma in Situ or Minimally Invasive Adenocarcinoma

Station #2

Participants
Takuya Yagi, Niigata City, Niigata Prefecture, Japan (*Presenter*) Nothing to Disclose
Motohiko Yamazaki, MD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Ishikawa, MD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose
Hidefumi Aoyama, MD, PhD, Niigata, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To distinguish invasive adenocarcinoma (IADC) from adenocarcinoma in situ (AIS) or minimally invasive adenocarcinoma (MIA) by quantitative computed tomography (CT) texture analysis.

METHOD AND MATERIALS

This retrospective study included 54 consecutive patients with 63 pure or part-solid ground-glass nodules (GGNs) ≤3 cm that were surgically resected and pathologically diagnosed as AIS, MIA, or IADC between April 2011 and March 2015. Each tumor was manually segmented at 1-mm intervals on axial CT images and assessed using ImageJ, a software program for quantitative analyses. The quantitative CT texture parameters analyzed in each lesion included the whole tumor volume, weight, mean CT value, variance, skewness kurtosis, entropy, uniformity, contrast, and percentile CT numbers. The differences between the IADCs and the AIS-MIAs were evaluated by Mann-Whitney U-test, a logistic regression analysis, and receiver operating characteristic curves.

RESULTS

The pathologic analysis confirmed 31 IADCs (4 lepidic, 22 papillary, 3 mucinous, 1 papillary/mucinous, and 1 non-classified), 17 AISs, and 15 MIAs. Compared with the AIS-MIA group, the IADCs showed significantly larger mean CT values, variance, entropy, and CT attenuation values at the 10th, 25th, 50th, 75th, 90th, and 95th percentiles ($P<0.001$ each), but significantly smaller

skewness, kurtosis, uniformity, and contrast values (P<0.001 each) on the histogram. The multivariate analysis revealed that the only independent differentiator between the AIS-MIAs and the IADCs was the 90th percentile CT numbers (P<0.001), with excellent accuracy (area under the curve, 0.934). The best cut-off value of the 90th percentile CT numbers was −117 Hounsfield units (sensitivity 87%, specificity 91%)

CONCLUSION

The 90th percentile CT numbers can accurately distinguish IADCs from AIS-MIAs.

CLINICAL RELEVANCE/APPLICATION

The distinction of IADCs from AIS-MIAs by only visual assessment is difficult. Quantitative analyses can help distinguish them more accurately to identify proper treatments such as sublobar resection.

CH267-SD-WEA3 Value of Computed Tomography of the Chest in Patients with Acute Respiratory Distress Syndrome

Station #3

Participants
Christoph A. Berliner, MD, Hamburg, Germany (*Presenter*) Nothing to Disclose
Marcel Simon, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Maria Metschke, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Maria Kalsow, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans Klose, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Kluge, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Azien Laqmani, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The value of computed tomography (CT) of the chest in the management of patients with acute respiratory distress syndrome (ARDS) are ill defined. The aim of this study was to assess the clinical utility of CT scans of the chest in patients with ARDS using the Berlin definition.

METHOD AND MATERIALS

Retrospective study on all patients with ARDS in whom a CT scan of the chest was performed immediately prior to or during intensive care unit stay between 01/2007 and 06/2013.

RESULTS

During the study period CT scans were performed on 204 patients with ARDS. ARDS was most often due to hospital acquired pneumonia (53.9 %) and community acquired pneumonia (32.8 %). ARDS was classified as severe in 84.3 % and moderate in 15.2 % of cases. The most common pathologies of lung parenchyma were consolidations (94.1 % of cases), ground glass opacities (85.3 %) and interstitial changes (59.3 %). Furthermore, CT scans showed pleural effusions in 80.4 %, mediastinal lymphadenopathy in 66.7 %, signs of right ventricular strain and pulmonary hypertension in 53.9 %, pericardial effusion in 37.3 %, emphysema of the chest wall in 12.3 %, pneumothorax in 11.8 %, emphysema of the mediastinum in 7.4 % and pulmonary embolism in 2.5 % of cases. Results of CT scans lead to changes in management in 26.5 % of cases. Mortality was significantly increased in patients with involvement of lung parenchyma of more than 80 % (p = 0.004). Intrahospital transport from the ICU to the radiology department lead to critical incidents in 17 cases (8.3 %).

CONCLUSION

Systematic evaluation of thoracic CT scans yielded information useful for making a diagnosis, predicting prognosis and recognizing concomitant disorders requiring therapeutic interventions. In 1 out of 4 cases results of CT scans lead to changes in management.

CLINICAL RELEVANCE/APPLICATION

Critically ill patients with ARDS are less likely to die if CT scan lead to changes in management.

CH268-SD-WEA4 Dual Energy CT Pulmonary Angiography with 6 g Iodine - a Propensity Score-Matched Study

Station #4

Participants
Andreas A. Meier, MD, New York, NY (*Presenter*) Nothing to Disclose
Kai Higashigaito, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Katharina Martini, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Moritz Wurnig, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Burkhardt Seifert, PhD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Dagmar Keller Lang, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Thomas Frauenfelder, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the performance of low contrast media (CM) dose dual-energy computed tomography pulmonary angiography (CTPA) with advanced monoenergetic reconstructions in patients with suspected pulmonary embolism (PE).

METHOD AND MATERIALS

The study had institutional review board approval; all patients gave written informed consent. Forty-one patients (25 men, 16 women, mean age 62.9±14.7 years) undergoing low CM dose (15ml, 6g iodine) dual-energy CTPA with advanced monoenergetic reconstructions were matched via propensity-scoring based on logistic regression analysis with a comparison group of 41 patients (24 men, 17 women, mean age 62.7±13.9 years) undergoing standard CM dose single-energy CTPA (80ml, 24g iodine). Subjective (noise, artifacts) and objective (attenuation, noise, contrast-to-noise ratio (CNR)) image quality was assessed at the level of the

pulmonary artery, the right lower lobe pulmonary artery, the right inferior pulmonary vein, the aorta, the brachiocephalic vein, and the subclavian vein by two blinded, independent readers. All patients underwent clinical follow-up after three months for evaluation of adverse events.

RESULTS

Interrater agreement for subjective image quality at the different levels in both groups ranged from fair to excellent (ICC: 0.46-0.84); agreement for objective image quality was excellent (ICC: 0.83-0.93). There was no significant difference regarding subjective noise (p=0.15-0.72) and artifacts (p=0.16-1) between the low and the standard CM dose group. There was no significant difference regarding CNR between the CM dose groups (p=0.11-0.87). 7/41 (17%) patients in the low and 5/41 (12%) in the standard CM dose group were diagnosed with PE (p=0.32). No patient suffered from subsequent PE or PE-associated death during follow-up.

CONCLUSION

Dual-energy CTPA with advanced monoenergetic reconstruction is feasible with 15ml CM (6g iodine) and allows for the diagnosis and safe exclusion of PE.

CLINICAL RELEVANCE/APPLICATION

In patients with impaired kidney function, CTPA can be performed with a low volume of CM using dual-energy and advanced monoenergetic image reconstructions with the benefit of reducing the risk of developing contrast-induced nephropathy.

CH269-SD-WEA5 Effects of the Radiation Dose and Type of Reconstruction Algorithms on the Measurement of Small Pulmonary Nodules with Low Dose CT:A Phantom Study

Station #5

Participants
Yeon Joo Jeong, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Ji Won Lee, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Geewon Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Min Ki Lee, Pusan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify the effect of the radiation dose used for the examination and type of reconstruction algorithms on the measurement of simulated lung nodules with low dose CT.

METHOD AND MATERIALS

Fifteen synthetic nodules of three radiodensities (100, -630, -800 HU) and five sizes (nominal diameters of 12, 10, 8, 5, and 3 mm) were inserted into an anthropomorphic chest phantom and scanned with techniques varying in CTDIvol (from 0.18 mGy to 1.74 mGy). Images were reconstructed by filtered back projection (FBP) and hybrid iterative reconstruction (IR) at 4 different denoising strength levels (30%, 50%, 80%, 100%). Nodule diameter, mass (diameter x density), and volume were measured from the each reconstructed CT images. We calculated and compared the absolute percentage error (APE) of measurements on each data set.

RESULTS

The APEs of nodule size, mass, and volume at the CTDIvol of 0.18mGy were significantly higher than those at other levels of CTDIvol ($p < 0.001$). For solid nodules, CTDIvol was 0.18 mGy, while ground glass opacity (GGO) nodules required a slightly higher CTDIvol of 0.33 mGy for lung nodule measurement. The effect of radiation dose was more pronounced for smaller GGO nodules ($p<0.001$). No clinically significant difference was observed between FBP and different levels of hybrid IR in the APEs of nodule size, mass and volume.

CONCLUSION

Lung nodule measurements in ultralow-dose CT with CTDIvol of 0.33mGy by application of any reconstruction algorithms showed a reliable accuracy in a phantom study.

CLINICAL RELEVANCE/APPLICATION

Results of our phantom study supports that lung nodule measurements in ultralow-dose CT can be reliably compared despite different iterative reconstruction algorithms.

CH270-SD-WEA6 Measurement of Pulmonary Nodule Size with Digital Tomosynthesis, Plain Radiography, and Dual-energy Subtraction Radiography

Station #6

Participants
Eun Young Kim, MD, Suwon , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joo Sung Sun, MD, Suwon-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dong Hyun Lee, MD, SUWON, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Taeyang Ha, MD, Suwon, Korea, Republic Of (*Presenter*) Nothing to Disclose
Pae Sun Suh, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyung Joo Park, MD, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

(1) To evaluate accuracy, intra- and interobserver variability for nodule size manual measurement on DTS, CXR, and DES images (2) investigate factor affecting nodule size measurement

METHOD AND MATERIALS

Total 120 images comprising four different size (5, 8, 10, 12mm) artificial nodules in four different locations (upper, middle, and lower) and three different depths (anterior, middle, and posterior) were prepared for each set of modality. Four observers

independently measured twice the right to left (R-L) and superior to inferior (S-I) diameter of nodules on randomly arranged three sets of image data. Nodule size measurement errors against actual size on CXR, DES and DTS were compared and whether anatomic characteristics (location, depth) of nodule affect measurement variation was assessed. Intra- and inter-observer reproducibility were calculated. Bland-Altman plot and intraclass correlation coefficient (ICC) were used for statistical analysis.

RESULTS

On DTS, non-measurable nodule was not found. However, average number of non-measurable nodule on CXR and DES were 33 and 37, respectively. Manual measurement using DTS showed higher accuracy and reproducibility than those of using CXR, DES. The overall mean measurement error was 0.25mm (SD:1.03) on CXR, -0.14mm (SD:1.20) on DES and -0.09mm (SD:0.41) on DTS. The mean measurement error on DTS was -0.05mm for R-L diameter and -0.25mm for S-I diameter. In terms of factor affecting size measurement on DTS, measuring R-L diameter was more accurate for nodules located in middle depth than measuring S-I diameter (measurement error -0.02 for R-L and -0.21 for S-I diameter). Inter-observer variability between four observes was 0.87 for CXR, 0.83 for SUB and 0.98 for DT. Intra-observer variability was almost perfect for all imaging modalities (CXR;0.93, SUB;0.93, DT;0.96).

CONCLUSION

The manual measurement of nodule on DTS showed higher accuracy and less inter-observer variability compared with DES and CXR. However, limited depth resolution and in-plane artefact of DTS could be a limiting factor for nodule size measurement.

CLINICAL RELEVANCE/APPLICATION

DTS seems to be a superior modality for size measurement of pulmonary nodule compared with CXR and DES. Also, understanding the limiting factors for accurate size measurement could maximize effectiveness of nodule follow up with DTS in clinical practice.

CH169-ED-WEA7 Respiratory Tract Infections (RTIs) in Returning Travelers: Imaging Findings and Differential Diagnosis

Station #7

Awards
Certificate of Merit

Participants
Tomas C. Franquet, MD, Barcelona, Spain (*Presenter*) Nothing to Disclose
Kyung S. Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Edson Marchiori, MD, PhD, Rio de Janeiro, Brazil (*Abstract Co-Author*) Nothing to Disclose
Kyong R. Peck, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Arthur Soares-Sousa Jr, Sao Jose do Rio Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Takeshi Johkoh, MD, PhD, Itami, Japan (*Abstract Co-Author*) Research Consultant, Bayer AG Research Consultant, F. Hoffman-La Roche Ltd

TEACHING POINTS

Review the spectrum of imaging findings of varied respiratory tract infections (RTIs) in returning travelers Correlate imaging findings with clinical setting and geographic location Provide a structured framework for formulating a differential diagnosis

TABLE OF CONTENTS/OUTLINE

With increasing international travel, a number of respiratory tract infections (RTIs) have emerged as important health threats among travelers to regions of the world where these infections are endemic. This exhibit will review and illustrate the high-resolution CT manifestations of varied travel-related respiratory tract infections (RTIs).**Bacterial infections:** Meliodosis, Legionnaires' disease and leptospirosis**Rickettsial infections****Fungal infections:** Histoplasmosis, Cryptococcosis, Coccidiodomycosis, Paracocidiodomycosis**Viral infections:** Middle East respiratory syndrome (MERS), Dengue), Hantavirus and Pumala virus, Chikungunya virus**Parasites and worms:** Paragonimiasis, Schistosomiasis,Filariasis and ToxocariasisRespiratory tract infections (RTIs) in returning travelers vary with the specific causative microorganism and the patient's immune status. Knowledge on the geographic location and the recognition of specific imaging features on specific RTI allow the formulation of a focused differential diagnosis.

CH196-ED-WEA8 Mediastinal and Pleural MRI: Practical Approach for Daily Practice

Station #8

Awards
Identified for RadioGraphics

Participants
Constantine A. Raptis, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose
Sebastian R. McWilliams, MBBCh, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Jordi Broncano, MD, Cordoba, Spain (*Abstract Co-Author*) Nothing to Disclose
Daniel B. Green, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Understand important indications for the use of mediastinal and pleural MRI in daily practice2. Review protocol considerations that can be applied to answer clinical questions3. Recognize key imaging findings that can be encountered on MRI examinations of the mediastinum and pleura

TABLE OF CONTENTS/OUTLINE

1. Protocol designa) Sequence menu for mediastinal and pleural MRIb) Tips on selecting appropriate MRI sequences to answer specific clinical questionsc) Considerations for optimization of mediastinal and pleural MRI sequences2. Indications for mediastinal and pleural MRIa) Thymic hyperplasia vs thymic massb) "Don't touch" mediastinal lesions - cystic and lymphatic lesionsc) Identifying targets for biopsy or surgical resectiond) Determining invasion of mediastinal structures and vesselse) Characterization of pleural

masses and effusionsf) Evaluation of diaphragmatic motion3. Key interpretative considerationsa) Understanding the difference between "don't touch" and "need further evaluation" mediastinal lesionsb) Adding value to reports on mediastinal MRI examinations - focusing on clinical questions

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
Sanjeev Bhalla, MD - 2016 Honored Educator

CH206-ED-WEB7

Pulmonary Lesions in Patients with Extrathoracic Malignancy: Lessons in Differentiating Pulmonary Metastases from Unrelated New Thoracic Malignancy

Wednesday, Nov. 30 12:45PM - 1:15PM Room: CH Community, Learning Center Station #7

Awards
Certificate of Merit

Participants
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Sarah L. Sheard, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Konstantinos Stefanidis, MD, PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sisa Grubnic, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Brendan Tinwell, MBBS, 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

When solitary pulmonary lesions are encountered on CT in patients with known or suspected extrathoracic primary disease, the radiologist's interpretation is critical in determining whether the pulmonary disease is metastatic or due to an unrelated new malignancy. The purpose of this exhibit is toDiscuss radiological features used to differentiate primary from metastatic pulmonary disease.
Highlight clinical knowledge of disease patterns that can assist with the clinical determination of primary vs metastatic disease.
Consider when to biopsy and limitations of histology/immunohistochemistry.

TABLE OF CONTENTS/OUTLINE

Multiple challenging clinical scenarios from a multidisciplinary tumor board are presented, with teaching points highlighting how clinical decisions were determined.Examples/teaching points:Morphological clues: e.g. spiculation, air-space configuration, endobronchial, endovascular disease.Consideration of pathways of disease spread e.g. carcinoma/lymphoma from intrathoracic/extrathoracic sites.Differentiation of metastatic from primary squamous cell lung cancer (radiology, pathology, P16 etc).Relative metastatic potential, spread patterns, rates of metachronous/synchronous tumors and associations of different tumors.Relative growth rates e.g. air-space colorectal metastasis vs lepidic predominant adenocarcinoma.

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/

Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

CHS-WEB

Chest Wednesday Poster Discussions

Wednesday, Nov. 30 12:45PM - 1:15PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Smita Patel, MBBS,FRCR, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

CH271-SD-WEB1 Progression of Interstitial Lung Disease in Patients Treated with Stereotactic Body Radiation Therapy

Station #1

Participants
Stephen M. Lyen, FRCR, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Daniel Glick, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Lisa Le, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Meredith Giuliani, MBBS, MEd, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Sonja Kandel, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Patrik Rogalla, MD, Toronto, ON (*Presenter*) Research Grant, Toshiba Corporation; Speakers Bureau, Bayer AG

PURPOSE

To determine whether SBRT induces progression of interstitial lung disease (ILD) contralateral to treatment site compared to non-cancer ILD patients.

METHOD AND MATERIALS

Patients treated with SBRT from October 2004 to March 2015 were identified from a prospective database. CT scans pre- and 1-year post-treatment were reviewed by a thoracic radiologist. The lung contralateral to the side of SBRT was assessed and the extent of total ILD, proportion of reticulation, honeycombing, and ground glass were scored to the nearest 5% at 6 anatomical levels. The coarseness of fibrosis was scored and the ILD pattern classified according to ATS guidelines. A control cohort of ILD patients without lung cancer who had their baseline and 1 year CTs scored according to the same method was used for comparison. The baseline scans were obtained from Apr 2008 to Oct 2014. Our primary outcome measures were change in total disease extent score (TDES) and the presence of >10% increase in ILD extent at any level. Imaging scores and SBRT were subject to uni- and multivariate linear regression analysis and logistic regression analysis.

RESULTS

607 SBRT patients were assessed and 21 (3.4%) patients were found to have features of ILD on pre-treatment scans (mean age 76 ± 11 years). 25 were patients in the non-cancer ILD cohort (mean age 62 ± 11 years). Average time to follow up scan was 12.7 and 13 months for SBRT and non-cancer patients respectively. In total, there were 13 patients with imaging consistent with usual interstitial pneumonia (UIP), 26 with possible UIP, and 7 inconsistent with UIP. SBRT was a significant predictor of an increase in ILD extent >10% at any level ($p<0.05$), but not for change in total disease extent score on both univariate and multivariate analysis. UIP was a significant predictor of progression in both primary outcomes ($p <0.01$). None of the imaging descriptors (ground glass, reticulation, honeycombing), traction bronchiectasis or coarseness score were significant predictors of progression.

CONCLUSION

SBRT and UIP are significant predictors of a >10% increase in ILD extent at any level. Further long-term studies will be required to determine this effect on morbidity and survival.

CLINICAL RELEVANCE/APPLICATION

Our findings suggest that SBRT could increase the degree of ILD progression compared to non-cancer ILD patients which may have implications on decision making.

CH272-SD-WEB2 Detection of Lung Carcinoma with Predominant Ground-glass Opacity on CT Using Temporal Subtraction Method: JAFROC Observer Study

Station #2

Participants
Takashi Terasawa, MD, Kitakyushu, Japan (*Presenter*) Nothing to Disclose
Takatoshi Aoki, MD, PhD, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose
Seiichi Murakami, Kitakyusyu, Japan (*Abstract Co-Author*) Nothing to Disclose
Masami Fujii, MD, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose
Chihiro Chihara, MD, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukunori Korogi, MD, PhD, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose
Michiko Kobayashi, MD, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshiko Hayashida, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We have been developing a new temporal subtraction (TS) method in order to significantly reduce misregistration artifacts on the subtraction images in successive thoracic CTs, and have shown that TS can improve the diagnostic accuracy of solid lung nodules less than 2cm. However, the performance of TS for the detection of the lung cancer with predominant ground-glass opacity (LC-pGGO) has not been clarified. The purpose of this study is to evaluate the usefulness of TS for the detection of LC-pGGO with jackknife free-response receiver operating characteristics (JAFROC) observer study.

METHOD AND MATERIALS

Twenty-five pairs of standard-dose CT and their TS images in patients with LC-pGGO and 25 pairs of those in patients without nodule were used for an observer performance study. A total of 31 LC-pGGO lesions, ranging in size from 5 to 22 mm, were identified as the reference standard of actionable lesions (GGO lesions increased in size or demonstrated appearance or growth of the solid component) by two thoracic radiologists. Eight radiologists (four attending radiologists and four radiology residents) participated in this observer study. Ratings and locations of "lesions" determined by the observers were utilized for assessing the statistical significance of differences between radiologists' performances without and with the CT-TS images in JAFROC analysis. The statistical significance of differences in the reviewing time was determined by use of a two-tailed paired Student's t test.

RESULTS

The average figure-of-merit (FOM) values for all radiologists increased to a statistically significant degree, from 0.861 without the CT-TS images to 0.912 with the images (P<.001). The average sensitivity for detecting the actionable lesions was improved from 73.4 % to 85.9 % at a false-positive rate of 0.15 per case by use of the CT-TS images. The reading time with CT-TS images was not significantly different from that without.

CONCLUSION

The use of CT-TS would improve the observer performance for the detection of the LC-pGGO without considerably extending the reading time.

CLINICAL RELEVANCE/APPLICATION

A CT temporal subtraction method can sufficiently assist the radiologists' interpretation for the detection of the lung cancer with predominant ground-glass opacity.

CH273-SD-WEB3 Lung Perfused Blood Volume (PBV) Value as a Prognosis Factor for Idiopathic Pulmonary Fibrosis (IPF)

Station #3

Participants
Masahiro Kobayashi, MD, Tokyo, Japan (*Presenter*) Nothing to Disclose
Nobuyuki Shiraga, MD, Ohta-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose
Hideaki Suzuki, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Keiko Matsumoto, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Keishi Sugino, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Sakae Honma, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Idiopathic pulmonary fibrosis (IPF) is a chronic and progressive interstitial pneumonia with a poor prognosis, and there are few imaging prognosis factors to predict disease progression. It is difficult to predict clinical course of IPF with conventional CT, because conventional CT provides only morphological information of fibrosis. Lung perfused blood volume images with dual-energy CT is feasible and provides not only morphological information, but also hemodynamic information of the lung. We assume that there may be some relations between prognosis of pulmonary fibrosis and pulmonary hemodynamics, so the purpose of this study was to assess and evaluate lung PBV imaging as a prognosis factor for IPF.

METHOD AND MATERIALS

Institutional review board approval and written informed consent were obtained. Twenty-six patients with IPF (mean age: 74.8 years, range: 60-86 years) underwent pulmonary CTA using dual-energy CT. Lung perfused blood volume images were obtained by three-material decomposition algorithm, and mean lung PBV values were calculated. To evaluate the perfusion decrease in lower lung fields, mean PVB value ratio (lung PBV value of lower lung field/upper lung field) was also calculated on the hypothesis that upper lung fields are relatively stable, less involved by fibrosis. We divided the patients into two groups; progressed group and stable group by checking the fibrosis progression with follow-up CT, and compared lung PVB value ratio between two groups.

RESULTS

Lung PVB images showed pulmonary perfusion defects in fibrosis areas. The areas where perfusion decrease were not noted adjacent to fibrosis tended to progress fibrosis. In contrast, the areas in which perfusion decrease were noted with slight fibrosis tended to be stable disease.Mean decreased lung PVB ratio in progressed group was significantly higher than that of stable group (1.05±0.15 vs 0.72±0.12, p<0.01).

CONCLUSION

Lung PVB shows the difference between progressing fibrosis and stable fibrosis areas, which is difficult with conventional CT. Lung PBV ratio may have the potential to be the new prognosis factor for IPF.

CLINICAL RELEVANCE/APPLICATION

With lung PVB images, calculating lung PVB value ratio has the potential to predict its clinical course of IPF.

CH274-SD-WEB4 Differential Pulmonary Artery Left Ventricular and Aortic Enhancement as a Predictor of Left Ventricular Systolic Dysfunction

Station #4

Participants
Joel P. Thompson, MD, Rochester, NY (*Presenter*) Nothing to Disclose
Timothy M. Baran, PhD, Rochester, NY (*Abstract Co-Author*) Research Consultant, Zenalux Biomedical Inc
Abhishek Chaturvedi, MD, Rochester, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Decreased cardiac output is linearly correlated with delayed aortic peak enhancement on CT angiography. We sought to determine

the prognostic significance of decreased aortic and left ventricular (LV) enhancement on pulmonary CTA (CTPA).

METHOD AND MATERIALS

CTPA protocols at our institution utilize timing bolus or bolus tracking techniques for IV contrast timing. Both protocols include a minimum 6 second delay to account for CT gantry transit time, allowing for aortic enhancement in normal patients. An IRB-approved retrospective review was performed of adults who received both an echocardiogram and CTPA within 48 hours of each other. LV systolic dysfunction was defined as LV ejection fraction (LVEF) <40% on echocardiogram; control cases being LVEF >50%. Exclusion criteria: central pulmonary emboli & pulmonary hypertension. CTPA contrast attenuation was measured in the main pulmonary artery, LV, and descending thoracic aorta. Subjective enhancement was also graded on a Likert 1-4 scale.

RESULTS

94 patients met inclusion criteria; 36 cases and 58 controls had similar gender composition, age, BMI, scan protocol, IV contrast volume and injection rate.When timing bolus protocol was used, LVEF <40% was associated with a significantly longer time to peak pulmonary artery attenuation (14.2 sec vs 9.3 sec, p<0.001). At an average IV contrast injection of about 4 cc/sec, decreased aortic to pulmonary artery enhancement ratio (Ao:PA) of 0.3 was associated with reduced LVEF, with a sensitivity of 77% and specificity of 82%. A decreased LV to pulmonary artery enhancement ratio (LV:PA) of 0.3 was also associated with reduced LVEF, with a sensitivity of 58% and a specificity of 96%. Subjective grading of decreased LV and aortic enhancement compared to pulmonary artery enhancement was predictive of LVEF <40% (LV, sensitivity=85%, specificity=96%; Aorta, sensitivity=97%, specificity=78%). Adding LV short axis diameter above 5.6 cm did not improve prediction of LV dysfunction.

CONCLUSION

Quantitative Ao:PA & LV:PA enhancement ratios below 0.3 and subjective assessment of decreased LV and aortic enhancement compared to the pulmonary artery were associated with LVEF <40%.

CLINICAL RELEVANCE/APPLICATION

Quantitative Ao:PA & LV:PA enhancement ratios below 0.3 and subjective assessment of decreased LV and aortic enhancement compared to the pulmonary artery were associated with LVEF <40%.

CH275-SD-WEB5 Lung Cancers Detected in Low-Dose CT Lung Cancer Screening Usually Show Exponential Growth

Station #5

Participants
Marjolein A. Heuvelmans, MD,PhD, Groningen, Netherlands (*Presenter*) Nothing to Disclose
Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Harry De Koning, Rotterdam, Netherlands (*Abstract Co-Author*) Research Grant, F. Hoffmann-La Roche Ltd Equipment support, Siemens AG Medical Advisory Board, F. Hoffmann-La Roche Ltd
Harry Groen, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Michel J. van Putten, MD, PhD, Enschede, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Matthijs Oudkerk, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Although exponential growth is assumed for lung cancer, there is only limited information on in-vivo quantification of this pattern. Purpose of this study was to evaluate and quantify growth patterns of lung cancers detected in a low-dose computed tomography (CT) lung cancer screening trial, in order to elucidate the development and progression of early lung cancer.

METHOD AND MATERIALS

Data from a randomized low-dose CT lung cancer screening trial were used. The trial was approved by the Ministry of Health. All participants gave informed consent. Solid lung nodules found at ≥3 CT examinations before lung cancer diagnosis were included. Nodule volume was determined semi-automatically by software (LungCARE, Siemens, Erlangen, Germany). Lung cancer volume (V) growth curves were fitted with a single exponential, expressed as $V=V1\exp(t/\tau)$, with t time from baseline (days), V1 estimated baseline volume (mm3), and τ estimated time constant. Overall volume-doubling time (VDT) for the individual lung cancer is given by $\tau*\log(2)$. The R2 coefficient of determination was used to evaluate goodness of fit.

RESULTS

Forty-seven lung cancers in 46 participants were included. Forty participants were male (87.0%); mean age was 61.7 (standard deviation, ±6.2) years. Nodules were followed for a median of 770 days (inter-quartile range [IQR]: 383–1102 days) before lung cancer diagnosis. One cancer (2.1%) was diagnosed after six CT examinations, six cancers (12.8%) were diagnosed after five CTs, 14 (29.8%) after four, and 26 cancers (55.3%) after three CTs. Median overall volume-doubling time was 348 days (IQR: 222-492 days). The fit of the exponential function was excellent, with median R2 of 0.98 (IQR: 0.94–0.99).

CONCLUSION

This study based on CT lung cancer screening provides in-vivo evidence that lung cancers usually evolve at an exponential growth rate. VDT can be used to describe the growth of lung nodules detected at low-dose CT lung cancer screening.

CLINICAL RELEVANCE/APPLICATION

This study shows that lung cancers usually grow exponentially, and provides a biological basis for the use of volume-doubling time for monitoring lung cancer growth rate in CT lung cancer screening.

CH276-SD-WEB6 Role of Massive-Training Artificial Neural Network {MTANN} Algorithm in Radiation Dose Reduction and Image Quality for Sub-milli Sievert Chest CT Examinations: A Preliminary Study

Station #6

Participants
Azadeh Tabari, Boston, MA (*Presenter*) Nothing to Disclose

Florian J. Fintelmann, MD, FRCPC, Boston, MA (*Abstract Co-Author*) Consultant, McKesson Corporation
Shaunagh McDermott, FFR(RCSI), Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael S. Gee, MD, PhD, Jamaica Plain, MA (*Abstract Co-Author*) Nothing to Disclose
Sarabjeet Singh, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Toshiba Corporation; Research Grant, General Electric Company; Research Grant, Koninklijke Philips NV

PURPOSE

To evaluate Massive-Training artificial neural network {MTANN} algorithm and Filter Back Projection (FBP) reconstruction techniques for 27% radiation dose reduction and image quality for chest CT

METHOD AND MATERIALS

In an IRB approved and HIPAA study, 13 patients (mean age 63.9 ± 11 years, M:F 9:4, weight 174.8 ± 38 lbs) underwent "routine" chest CT with standard and low dose. Patients were scanned on 128 slice MDCT {SOMATOM Definition Flash, & Discovery 750HD}. Only tube current was reduced to achieve low dose, compared to standard dose {120 kV, thickness 3 mm and scan length}. Low dose images were post processed with MTANN, which is a pattern-recognition technique based on the use of an artificial neural network as a filter. Radiation dose parameters, including CTDIvol, Dose Length Product and estimated effective dose was calculated as per ICRP103. Detailed CT image quality, including objective image noise, Hounsfield Unit values and contrast to noise ratio (CNR) were measured in thoracic aorta, pectoral muscles, para-spinal muscles, air outside the thoracic cavity. Standard dose images were considered as the reference standard for image quality and statistical analyses were performed using the t-test

RESULTS

Standard and low dose chest CT examinations were performed for clinical indications, including metastasis evaluation, pneumonia, pulmonary obstructive disease. Low dose chest CT images were acquired at 81% {CTDIvol 9.1±6/1.8 ± 0.2 mGy} lower dose. DLP was 66 ± 2 mGy.cm and 322.7 ± 217 mGy.cm, effective dose 1 mSv and 4.8 ± 3.3 mSv, for low and standard dose, respectively. Image noise was significantly decreased by 27% {62.3 ± 19/ 84.1 ± 28} in low dose MTANN images as compared to low dose FBP{$p < 0.004$}. HU values were similar in low dose MTANN (27.5 ± 23) as compared to standard dose (39.2 ± 10) ($p > 0.1$). CNR was significantly improved in MTANN compared to standard dose FBP images {$p<0.002$}

CONCLUSION

MTANN algorithm reconstructed CT images lowers noise by 27% in 81% low dose images {1.8 mGy} compared to conventional FBP

CLINICAL RELEVANCE/APPLICATION

Low dose chest CT acquired at 1.8 mGy is feasible with MTANN algorithm

SSM05

Chest (Nodule/Screening II)

Wednesday, Nov. 30 3:00PM - 4:00PM Room: S404AB

CH CT

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Edith M. Marom, MD, Ramat Gan, Israel (*Moderator*) Nothing to Disclose
Cristopher A. Meyer, MD, Madison, WI (*Moderator*) Stockholder, Cellectar Biosciences, Inc Investor, NeuWave, Inc

Sub-Events

SSM05-01 Risk Stratification of New Solid Nodules at Incidence CT Lung Cancer Screening

Wednesday, Nov. 30 3:00PM - 3:10PM Room: S404AB

Participants
Joan E. Walter, BSc, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marjolein A. Heuvelmans, MD,PhD, Groningen, Netherlands (*Presenter*) Nothing to Disclose
K Ten Haaf, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Peter M. Van Ooijen, MSc, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
U Yousaf-Khan, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Robin Peters, MD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Carlijn Van Der Aalst, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
G.H. De Bock, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Willem P. Mali, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Harry Groen, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Harry De Koning, Rotterdam, Netherlands (*Abstract Co-Author*) Research Grant, F. Hoffmann-La Roche Ltd Equipment support, Siemens AG Medical Advisory Board, F. Hoffmann-La Roche Ltd
Matthijs Oudkerk, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop a model for risk stratification of new solid nodules at the incidence screening rounds of a large randomized low-dose computed tomography (LDCT) lung screening trial, and assess the key determinants.

METHOD AND MATERIALS

This trial was approved by the Ministry of Health. All participants gave informed consent. In total, 7,557 individuals underwent baseline LDCT screening. Following baseline, incidence-screenings took place after 1, 3 and 5.5 years. This study included participants of the first two incidence screening rounds with solid non-calcified nodules, newly detected after baseline and in retrospect not present on previous screens. Lung cancer diagnosis was based on histology, and benignity was based on histology or a stable volume for ≥2 years. Multi-regression analysis was performed to develop a risk model considering 9 variables, namely: age, gender, pack-years, smoking status, time since previous scan, solid nodule count at baseline, nodule margin, nodule location, and nodule volume.

RESULTS

In the first two incidence screening rounds of the trial, radiologists registered 1,222 new solid nodules in 10.8% (787/7,295) of participants. A new solid nodule was lung cancer in 6.2% (49/787) of participants with new solid nodules (50 lung cancers in 49 participants). In 359 of 787 (45.6%) participants, no solid nodule had been found during baseline screening and a lower number of solid nodules at baseline screening significantly increased the probability of a new solid nodule being lung cancer (P=0.038). Nodule volume had a high discriminatory power (area under the receiver-operating curve: 0.795, 95% confidence interval: 0.728, 0.862, P<0.0001). After backwards stepwise selection, nodule volume, solid nodule count at baseline, and time since previous scan were included in the model, yielding an AUC of 0.825 (95% CI: 0.768, 0.882). The difference between the AUCs was non-significant (0.795 vs. 0.825, P=0.15).

CONCLUSION

New solid nodules are regularly found during LDCT screening. Due to their suspiciousness for malignancy appropriate stratification is necessary. Nodule volume is the key determinant in risk stratification, with only marginal improvement considering other risk factors.

CLINICAL RELEVANCE/APPLICATION

About 11% of participants in LDCT screening develop new solid nodules within 3 years. Nodule volume is the key determinant in risk stratification, with only marginal improvement considering other risk factors.

SSM05-02 Nodule Size is Poorly Represented by Nodule Diameter in Low-dose CT Lung Cancer Screening

Wednesday, Nov. 30 3:10PM - 3:20PM Room: S404AB

Participants
Marjolein A. Heuvelmans, MD,PhD, Groningen, Netherlands (*Presenter*) Nothing to Disclose
Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Gonda J. de Jonge, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

Peter M. Van Ooijen, MSc, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Matthijs Oudkerk, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the correlation between nodule diameter and nodule size of nodules found in low-dose computed tomography (CT) lung cancer screening.

METHOD AND MATERIALS

We investigated baseline data of 2,240 solid nodules (volume 50-500 mm3) in 1,500 lung cancer screening participants. Nodule volume, x, y, and z diameter and minimum / maximum diameter in any direction were generated by semi-automated software (LungCARE, Siemens). Range in maximum axial and mean nodule diameter per nodule volume category (50-100 mm3, 100-200 mm3, 200-300 mm3, 300-400 mm3, 400-500 mm3) was determined. Semi-automated nodule volume represented nodule size. Intra-nodule diameter variation was defined as maximum minus minimal nodule diameter.

RESULTS

Median participant age was 59 years, 14.1% were women. Median nodule volume was 82.4 mm3 (interquartile range [IQR], 62.9–125.4 mm3). Median nodule diameter was 6.1 mm (IQR, 5.4–7.2 mm) for mean diameter, and 6.6 mm (IQR, 5.9–7.7 mm) for maximum axial diameter. Range in mean nodule diameter per volume category varied from 8.55 mm (3.0 – 11.5 mm) for nodules with volume of 50-100 mm3 to 6.1 mm (7.2 – 13.3 mm) for nodules with volume of 200-300 mm3; range in maximum axial diameter varied from 11.2 mm (7.3 – 18.5 mm) for nodules with volume of 200-300 mm3, to 7.0 mm (9.1 – 16.1 mm) for nodules with volume of 400-500 mm3. Intra-nodule diameters varied by a median of 2.8 mm (IQR, 2.2-3.7 mm). Intra-nodule diameter variation for smaller intermediate-sized nodules (50-200 mm) was 2.8 mm (IQR 2.2-3.5 mm), and was smaller than intra-nodule diameter variation for larger intermediate-sized nodules (200-500 mm; median 3.6 mm [IQR 2.5-5.1 mm], P<0.01).

CONCLUSION

Nodule size is poorly represented by diameter, as a nodule has an infinite number of diameters, but only one volume. Median intra-nodule diameter variation was found to be higher as the 1.5mm LungRADS cutoff for nodule growth.

CLINICAL RELEVANCE/APPLICATION

The relationship between nodule diameter and nodule size is poor, which may lead to misclassification of lung cancer screening participants in diameter-based nodule management protocols.

SSM05-03 Effects of Contrast-enhancement, Reconstruction Slice Thickness and Convolution Kernal on the Diagnostic Performance of Radiomics Signature in Solitary Pulmonary Nodule

Wednesday, Nov. 30 3:20PM - 3:30PM Room: S404AB

Participants
Yanqi Huang, Guangzhou, China (*Presenter*) Nothing to Disclose
Lan He, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the effects of contrast-enhancement, reconstruction slice thickness and convolution kernel on the differential diagnosis performance of radiomics signature in SPNs, and to determine the optimal imaging parameters for extracting radiomics features.

METHOD AND MATERIALS

240 patients with SPNs(malignant,n=180;benign,n=60) underwent un-enhanced CT(NECT) and contrast-enhanced CT(CECT) which were reconstructed with different slice thickness and convolution kernel. 150 radiomics features were extracted separately from each set of CT and feature selection was done with Lasso logistic regression model with which a radiomics signature was built. Diagnostic performance of radiomics signatures of CT for discriminating benign and malignant SPNs were assessed and compared with respect to the area under the curve(AUC) of the receiver operating characteristic curve(ROC) and net reclassification improvement(NRI).

RESULTS

NECT-based radiomics signature demonstrated better discrimination and classification capability than CECT in both primary(AUC:0.979vs.0.879,p<0.001;NRI=1.667) and validation cohort(AUC:0.783 vs.0.726,p=0.017;NRI=0.200). Thin-slice(1.25mm) CT-based radiomics signature has better diagnostic performance than thick-slice CT(5mm) in both primary(AUC:0.979vs.0.867,p<0.001;NRI=1.467) and validation cohort(AUC:0.783vs.0.712,p=0.008;NRI=0.289). Standard convolution kernel-based radiomics signature had higher performance than lung convolution kernel-based CT in both primary(AUC:0.867vs.0.773,p<0.001;NRI=1.156) and validation cohort (AUC:0.712vs.0.686,p=0.007;NRI=0.311).

CONCLUSION

The contrast-enhancement, reconstruction slice thickness and convolution kernel affected the diagnostic performance of radiomics signatures in SPNs, of which un-enhanced, thin-slice and standard convolution kernel-based CT is more informative.

CLINICAL RELEVANCE/APPLICATION

this study presents that the contrast-enhancement, reconstruction slice thickness and convolution kernel affect the diagnostic performance of Radiomics signature in SPNs, of which un-enhanced, thin-slice and standard convolution kernel-based CT is more informative. The difference in parameters of CT image acquisition should be considered in the future radiomics studies.

SSM05-04 Computerized Margin and Texture Analyses for Differentiating Consolidative Mucinous Adenocarcinoma and Bacterial Pneumonia

Wednesday, Nov. 30 3:30PM - 3:40PM Room: S404AB

Participants
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PURPOSE

We sought to create a computerized method of computed tomography (CT)-based margin analysis, and to retrospectively investigate the value of computerized margin and texture analyses for differentiating consolidative mucinous adenocarcinoma and bacterial pneumonia manifesting as air space consolidation.

METHOD AND MATERIALS

We established a method of selective margin analysis by comparing the target lesion with normal lung attenuation, drawing a slope to represent the attenuation changes. This approach was applied to 97 patients with pathologically confirmed consolidative mucinous adenocarcinoma (n=52) or proven bacterial pneumonia (pneumococcal, n=24; Klebsiella pneumonia, n=21), all of whom underwent enhanced CT imaging between January 2005 and April 2015. Inter-value correlations between 1 mm and 5 mm data and among multiple regions of interest were obtained using intra-class correlation coefficient values. CT visual assessment findings and CT margin and texture parameters were compared for differentiating the two disease entities.

RESULTS

The internal attenuation and margin parameters in multiple regions of interest showed excellent intraclass correlation coefficient values in 1 mm and 5 mm CT images, respectively. All measured attenuation slopes obtained from the variable pixel numbers at the margins revealed a difference between mucinous adenocarcinoma and bacterial pneumonia ($p < 0.001$), and mucinous adenocarcinoma produced a sharply declining attenuation slope at the margin of the lesions when compared with bacterial pneumonia. On multivariable logistic regression analysis, pneumonia had an ill-defined margin (odds ratio (OR), 4.84; 95% CI, 1.26–18.52; $p = 0.02$), surrounding ground-glass opacity (OR, 8.55; 95% CI, 2.09–34.95; $p = 0.003$), and gradually declining attenuation at the margin (OR, 12.63; 95% CI, 2.77–57.51, $p = 0.001$) when compared with mucinous adenocarcinoma.

CONCLUSION

Attenuation slopes at the margin of lesions derived from CT images have the potential to act as an imaging parameter for differentiating mucinous carcinoma and bacterial pneumonia.

CLINICAL RELEVANCE/APPLICATION

By defining attenuation slopes at the margins of lesions, our findings introduce CT margin analysis as a potential biomarker for differentiating mucinous adenocarcinoma from bacterial pneumonia manifesting as air space consolidation.

SSM05-05 Chest X-ray Equivalent Ultralow Dose Chest Computed Tomography for Pulmonary Nodule Detection - A Prospective Intra-individual Comparative Study

Wednesday, Nov. 30 3:40PM - 3:50PM Room: S404AB

Participants
Michael Messerli, MD, St. Gallen, Switzerland (*Presenter*) Nothing to Disclose
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Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Sebastian Leschka, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Simon Wildermuth, MD, St. Gallen, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this prospective intra-individual comparative study was to evaluate the tin filtration technique at 100 kV at an exposure level comparable to plane film chest X-ray for pulmonary nodule detection in a clinical scenario without patient pre-selection.

METHOD AND MATERIALS

202 patients undergoing clinically indicated standard dose chest CT were prospectively included and scanned with an additional ultralow dose protocol at 100 kV with tin filtration and fixed tube current at 70 mAs. Standard dose CT was read in consensus by two board-certificated radiologists to determine the presence of lung nodules and served as standard of reference (SOR). Two radiologists independently assessed and recorded the presence of lung nodules and their locations on ultralow dose CT. Sensitivity and specificity of the ultralow dose protocol was compared against the SOR, including subgroup analysis of different nodule sizes (≤ 4, 5-8, ≥ 8 mm), nodule type (solid, subsolid, calcified nodules) and BMI (≤ 30, > 30 kg/m2).

RESULTS

441 nodules were definded as SOR with a median diameter of 3 mm (range 1 - 24 mm). Overall sensitivity for nodule detection in ultralow dose CT was 91% including all nodules regardless of size, type and patient BMI. In a per-patient analysis, the sensitivity and specificity of ultralow dose CT for the detection of the presence of at least one nodule was 98% and 97%, respectively for

normal weighted patients (BMI ≤ 30 kg/m2). In overweigthed patients (n = 39) with a BMI > 30 kg/m2 per-patient sensitivity and specificity for nodule detection was 96% and 82%, respectively. The mean (± SD) effective radiation dose for ultralow dose CT was 0.13 ± 0.01 mSv, whereas the mean effective dose of standard dose CT was 1.8 ± 0.7 mSv.

CONCLUSION

Our study suggests that ultralow dose CT with a 100 kV protocol with spectral shaping, that is comparable to the exposure level of plane film chest X-ray, is suitable for the detection and follow-up of pulmonary nodules without patient selection.

CLINICAL RELEVANCE/APPLICATION

Given the promising results of lung cancer screening programs, X-ray equivalent exposure with advantages of cross-sectional CT images will be a major argument against parties expressing reservation against these programs.

SSM06

Chest (Radiation Dose)

Wednesday, Nov. 30 3:00PM - 4:00PM Room: S406B

CH CT SQ

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants
Seth J. Kligerman, MD, Denver, CO (*Moderator*) Nothing to Disclose
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Moderator*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;

Sub-Events

SSM06-01 Effect of Tin Filtration on Image Quality and Radiation Dose: Preliminary Experience With a Third-Generation Dual-Source CT System in 133 Adult Patients

Wednesday, Nov. 30 3:00PM - 3:10PM Room: S406B

Participants
Rayyan A. Daghistani, MBBS, Lille, France (*Presenter*) Nothing to Disclose
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Martine J. Remy-Jardin, MD, PhD, Lille, France (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

To evaluate the image quality and radiation exposure of low-kV examinations with tin pre-filtration.

METHOD AND MATERIALS

133 consecutive patients, less than 90 kg of body weight (b.w.) (mean BMI: 23.35 kg/m2), underwent sequential non-contrast chest CT examinations for the follow-up of chronic respiratory disease: (a) the first examination was obtained with a second-generation dual-source CT system (Somatom Flash) with an individually-adapted selection of the kilovoltage according to the patient's weight (50-80 kg b.w.: 100 kV/65 mAs; 80-90 kg b.w.: 120 kV/65 mAs) (Group 1); (b) the second examination was performed with a third-generation dual-source CT (Somatom Force) at 100 kV with tin pre-filtration (100 Sn kV/300 mAs) (Group 2). In both groups, chest examinations were performed in dual-source, single-energy, high-pitch helical mode with milliamperage modulation; images were reconstructed with iterative reconstructions (Group 1: SAFIRE; Group 2: ADMIRE; strength=3 in both groups). Between T0 and T1, the patient's weight was stable (±3kg) and the severity of the underlying disease was not dramatically modified.

RESULTS

In Group 1, CT examinations were obtained at 100 kV (n=112; 84%), 120 kV (n=21; 16%) (mean DLP : 67.2 ± 33.07 mGy.cm). Compared to Group 1, Group 2 examinations were characterized by : (a) a significantly lower mean objective noise (22.06 ± 5.9 HU vs 25.52 ± 8.78 HU; p=0.0006) ; (b) a better SNR (2.44 ± 1.2 vs 1.99 ± 0.89 ; p<0.0001); (c) a significantly higher score of visibility of normal anatomical structures on lung and mediastinal images (1.27 ± 0.12 vs 1.18 ± 0.13 ; p<0.0001) ; (d) a significantly lower DLP (27.08 ± 7.22 mGy.cm ; p<0.0001) (effective dose: 0.4 mSv). Similar trends for improvement in objective and subjective image noise and SNR and reduction in radiation exposure were observed in the subgroup of 112 patients scanned at 100 kV at T0, then at 100 Sn kV at T1.

CONCLUSION

Tin pre-filtration at 100 kV improves the image quality and reduces the radiation exposure of routine chest examinations in adult patients <90 kg b.w.

CLINICAL RELEVANCE/APPLICATION

High image quality at very low dose levels can be achieved by using a Sn 100 kV-protocol for routine non-contrast chest CT examinations of adult patients of average size.

SSM06-02 Comparison of Chest CT Radiation Doses (CTDIvol, DLP, & SSDE) from ACR Dose Index Registry Across Different Geographical Regions and Types of Medical Facilities According To Age Groups

Wednesday, Nov. 30 3:10PM - 3:20PM Room: S406B

Participants
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Mythreyi Bhargavan-Chatfield, PhD, Reston, VA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare chest CT radiation doses (CTDIvol, DLP & SSDE) from the ACR Dose Index Registry (DIR) across different US facilities types and geographical regions

METHOD AND MATERIALS

Using Radiology PlayBook identification (RPID) numbers, we assessed CT dose metrics CTDIvol, DLP and (SSDE)) for 171,641chest CT studies (mean age 61.7±16.5yrs) in the ACR DIR from 2011-2015 (10% sample). Data were stratified according to the geographic census in to (New England (NE), Middle Atlantic (MA), South Atlantic (SA), East North Central (ENC), East South Central (ESC),West South Central (WSC), Mountain (MO) and Pacific(PA)) regions and then sub-stratified based on the year of CT exam (2011-15), patient age (≤ 40; 41-64; ≥65 years) and type of medical facility (academic, community, multispecialty, freestanding). Mean and standard deviations for maximum CTDIvol (mGy) and SSDE and DLP (mGy.cm) were calculated. ANOVA test was used to compare the variation

RESULTS

The national mean CTDIvol, SSDE and DLP for chest CT were 14±11, 15±11 and 470±349. There is significant variation among census divisions. The highest CTDIvol and DLP was seen for ESC (15±14, n=11403, 544±355, n=11336) and lowest CTDIvol was for NE (12±9, n=17450) (p<0.0001) and lowest DLP was for MO (364±298, n=6764). For SSDE, NE had the lowest (12±9, n=12028), and WSC had the highest values (17±10, n=2636). The mean SSDE values of academic, community, multispecialty and freestanding facilities were 15±2, 15±1, 14±3, 11±1 (p<0.0001), respectively. Across all 8 census divisions, young patients received higher dose compared to other age groups. The mean±SD CTDIvol, DLP and SSDE for <40 years age group were 14±11.9, 507±373, 16±11; while, 14±11, 489±366, 15±11 for 41-64 years and 12±10, 448±323 and 14±10 for >64 years (value<0.0001). Since the inception of the ACR DIR in 2011, chest SSDE has decreased by average 13.2% in different regions. The biggest decrease (15.2%) was in ESC; while there was no decrease in SA region

CONCLUSION

There were significant variations in the values of CTDIvol, DLP, and SSDE for chest CT among different US census regions. In all 8 census divisions, young adults received the higher dose compared to middle-age or elderly patients

CLINICAL RELEVANCE/APPLICATION

According to ACR DIR chest CT radiation dose has decreased over last 5 years across all regions of US but more efforts are needed to reduce dose in young adults

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

SSM06-03 Ultra-Low Dose CT in Raw-Data-Based Iterative Reconstruction for Lung Screening

Wednesday, Nov. 30 3:20PM - 3:30PM Room: S406B

Participants
Xin Sui, MD, Beijing, China (*Presenter*) Nothing to Disclose
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Zheng Yu Jin, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

the purpose of this study was to evaluate the sensitivity of ultra-low-dose CT with tin filtration (100Sn kVp) and advanced model-based iterative reconstruction (ADMIRE) for the detection of ground glass nodule (GGN) and partial solid nodules (pSN).

METHOD AND MATERIALS

58 patients (34 males, 24 females; mean [SD] age, 54.3[8.7] years) who were referred to the follow-up of GGN or pSN and underwent LDCT (100 kVp, 25 mAs) and ultra-low dose CT (100Sn kVp, 32mAs) scanning on a third-generation dual-source CT scanner (SOMATOM Force; Siemens Healthcare, Germany). All the CT images were reconstructed with ADMIRE. A reference standard was established by a consensus panel of 2 different radiologists on LDCT. Image noise and diagnostic confidence were assessed on LDCT and ultra-low dose CT. The detection of GGN and pSN was rated on ultra-low dose CT.

RESULTS

The effective radiation dose of ultra-low-dose was 0.08±0.03 mSv and it was significantly lower than that of the LDCT protocol which was 0.78±0.21 mSv (p<0.05). The mean body mass index (BMI) was 23.9 (±3.5) kg/m2. A total of 64 GGNs and 25 pSN were identified on LDCT images. The nodule size was ranged from 3.5 to 15.4 mm. All images with LDCT were of diagnostic quality. With ultra-low dose CT, the frequencies of nondiagnostic image quality were 2 (3.1%) GGNs and 1(4%) pSNs, which were raged from 3.5mm to 4.7mm on the lower lobe. A total of 86 (96.6%) and 85 (95.5%) on ultra-low dose CT were detected by two observers, respectively.

CONCLUSION

With tin filtration and ADMIRE, ultra-low-dose CT at a dose level equivalent to a chest x-ray has a comparable high sensitivity for GGN and pSN detection with LDCT.

CLINICAL RELEVANCE/APPLICATION

It is feasible to benefit patients to detect GGN and pSN by using ultra-low-dose CT which has a significantly low radiation dose

equivalent to a chest radiograph only.

SSM06-04 Age Dependent Benefits of Spectral Shaping in Ultra-High Pitch Non-Enhanced Chest CT of Pediatric Patients

Wednesday, Nov. 30 3:30PM - 3:40PM Room: S406B

Participants
Malte N. Bongers, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Michael Esser, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
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Ilias Tsiflikas, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the potential of spectral shaping in lowering the radiation exposure of ultra-high pitch non-enhanced chest CT (UHP) in pediatric patients.

METHOD AND MATERIALS

Three pediatric phantoms (newborn, one-year old, five-years old) were scanned with standard low-kV (70-90kV) and tin-filtered Sn100kV UHP protocols. Image noise (IN) and signal-to-noise-ratios (SNR) were determined and compared (figure 1). 150 pediatric patients (0-18 years) having received low-kV or Sn100 kV UHP non-enhanced chest CT were retrospectively selected from institution's PACS. Two blinded radiologists assessed both datasets regarding overall image quality (IQ, Likert scale) and diagnostic accuracy (ROC-statistics using clinical diagnosis and follow-up). In age- and water-equivalent-diameter-matched subgroups effective doses (ED) were calculated and compared between both protocols.

RESULTS

Comparing IN and SNR of low-kV and Sn100kV UHP, in the newborn phantom no significant differences could be found (INlow-kV: 23.77 ± 3.04, INSn100kV: 22.93 ± 2.92, p = 0.55; SNRlow-kV: 32.78 ± 4.09, SNRSn100kV: 34.18 ± 4.36, p = 0.50). Sn100kV UHP showed significantly lower IN and significantly higher SNR in the one-year old (INlow-kV: 23.77 ± 2.79, INSn100kV: 21.14 ± 2.59, p = 0.04; SNRlow-kV: 33.70 ± 3.92, SNRSn100kV: 38.07 ± 4.47, p = 0.03) and five-years old phantom (INlow-kV: 23.23 ± 0.91, INSn100kV: 19.64 ± 0.86, p < 0.0001; SNRlow-kV: 33.86 ± 1.35, SNRSn100kV: 40.38 ± 1.74, p < 0.0001). In pediatric patients, subjective IQ (IQlow-kV: 3.7, IQSn100kV: 3.8, p = 0.45) and diagnostic accuracy (AUClow-kV: 0.96, AUCSn100kV: 0.97) were not significantly different between both UHP protocols. ED of Sn100kV UHP was significantly lower in patients over five years (EDlow-kV: 0.16 mSv, EDSn100kV: 0.13 mSv, p = 0.07).

CONCLUSION

Additional spectral filtering (Sn100kV) of ultra-high pitch non-enhanced chest CT is capable to lower radiation exposure in pediatric patients without impairing image quality and diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

Due to the rapidly dividing cells and longer expected life time of children, lowering radiation exposure in pediatric CT is of highest interest to minimize the risk of radiation injury.

SSM06-05 Prospective Evaluation of Ultra-low Dose Computed Tomography Using 100 kV with Tin Filter: What is the Dose Reduction and is Computer-aided Pulmonary Nodule Detection Required?

Wednesday, Nov. 30 3:40PM - 3:50PM Room: S406B

Participants
Chi Wan Koo, MD, Rochester, MN (*Presenter*) Nothing to Disclose
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Joel G. Fletcher, MD, Rochester, MN (*Abstract Co-Author*) Grant, Siemens AG; ;

PURPOSE

Ultra-low dose chest CT (ULD) can be performed with low tube potential and a tin filter (100kV/Sn). Our purpose was to describe the observed radiation dose reduction, radiologist performance, and need for computer aided nodule detection (CAD) using ULD chest CT.

METHOD AND MATERIALS

After informed consent, 54 patients prospectively underwent routine low dose chest CT (LD CT) with automatic exposure control (120 kV, 70 quality reference mAs [QRM], CTDIvol of 6 ± 2 mGy) followed immediately by an ULD CT technique (100 kV/Sn, 50 QRM, CTDIvol of 0.4 ± 0.2 mGy). Reference standards were established by an experienced thoracic radiologist who marked each detected nodule on a dedicated computer workstation. Exams were anonymized and four different radiologists blinded to the technique and reference findings each interpreted the LD and ULD CTs. Automated comparison of reference and reader detections

was performed using an overlapping spheres method. The exams were separately processed using CAD with all CAD-labeled nodules categorized as true or false positives compared with the reference standard.

RESULTS

Forty-four reference nodules were detected in 25 of 54 (57%) patients (median size 11 mm; 13 ground glass, 19 solid, 12 partial solid). Two of 4 readers had lower nodule detection sensitivity for ULD compared to LD ($p<0.04$). Single reader sensitivity ranged from 46-87% for LD and from 39-65% for ULD CT. Sensitivity of double reading was 86% (38/44; 95% CI: 73 -95%) for LD, but only 59% (26/44; 95% CI: 43-74%) for ULD. Sensitivity for CAD was 75% (33/44) for LD and 70% (31/44) for ULD CT, with a median of 3 false positives per patient. CAD detected a greater proportion of missed nodules with ULD compared to LD (15/21[71%] vs. 11/21 [52 %], respectively).

CONCLUSION

ULD chest CT performed with 100 kV/Sn reduced patient dose by over 90% but decreased nodule detection sensitivity. CAD demonstrated persistent high sensitivity regardless of dose and detected nodules missed by radiologists. Use of 100 kV/Sn ultra-low dose CT in conjunction with CAD may be a feasible strategy to lower patient dose while preserving pulmonary nodule detection sensitivity.

CLINICAL RELEVANCE/APPLICATION

Use of CAD with 100 kV/Sn ultra low-dose chest CT for pulmonary nodule detection can reduce patient dose by over ten-fold while maintaining detection sensitivity.

SSM06-06 The Latest Model-Based Iterative Reconstruction (MBIR) with Lung-specific Setting: Quantification of Pulmonary Emphysema on Submillisievert CT

Wednesday, Nov. 30 3:50PM - 4:00PM Room: S406B

Awards
Student Travel Stipend Award

Participants
Akinori Hata, MD, Suita, Japan (*Presenter*) Nothing to Disclose
Masahiro Yanagawa, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Osamu Honda, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriko Kikuchi, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Tomiyama, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the influence of latest model-based iterative reconstruction (MBIR) with lung-specific setting, MBIR with conventional setting, and filtered back projection (FBP) on quantification of pulmonary emphysema on submillisievert chest computed tomography (CT) compared with routine-dose CT reconstructed using FBP.

METHOD AND MATERIALS

Ten patients were included in this prospective study. CT images at routine dose (Auto mA) and reduced dose (10 mA) were scanned. Radiation dose parameters were recorded. Reduced-dose CT was reconstructed using FBP with sharp kernel (FBP-Bone) and with soft tissue kernel (FBP-Standard) and MBIR with lung-specific setting (MBIR-Lung) and with conventional setting (MBIR-Standard). Routine-dose CT was reconstructed using FBP with sharp kernel. Lung volume and extent of emphysema were evaluated automatically. The extent of emphysema was obtained by calculating the percentage of low attenuation area (%LAA) values lower than -950 Hounsfield Units. The differences in the lung volume and %LAA between routine-dose FBP and each reduced-dose CT reconstructed using MBIR and FBP were assessed with the Steel test.

RESULTS

The estimated radiation dose was 5.98 ± 1.62 mSv for routine-dose CT and 0.18 ± 0.02 mSv for reduced-dose CT. There was no significant difference between the lung volume of each reduced-dose CT and that of routine-dose FBP ($p > 0.05$). There was no significant difference between the %LAA of MBIR-Lung and that of routine-dose FBP ($p > 0.05$). The %LAA of MBIR-Standard was significantly lower than routine-dose FBP ($p < 0.05$) and those of FBP-Bone and FBP-Standard were significantly higher than routine-dose FBP ($p < 0.01$).

CONCLUSION

The quantification of %LAA using MBIR-Lung on submillisievert CT was almost equal to routine-dose FBP.

CLINICAL RELEVANCE/APPLICATION

On submillisievert CT, MBIR with lung-specific setting may be the most appropriate for quantifying pulmonary emphysema.

RCB45

Tackling Lung Cancer Screening Informatics (Hands-on)

Wednesday, Nov. 30 4:30PM - 6:00PM Room: S401CD

CH IN

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

Participants
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Shawn M. Regis, PhD, Burlington, MA, (shawn.m.regis@lahey.org) (*Presenter*) Consultant, Medtronic plc

LEARNING OBJECTIVES

1) Understand the clinical and regulatory requirements for an accredited lung cancer screening program. 2) Understand several options for cliinical program organization. 3) Understand multiple options for tools available or buildable in the EMR, PACS, work list and Voice Recognition components of radiology workflow to support lung cancer screening. 4) Understand how informatics tools can support data collection and reserach in this rapidly evolving realm.

ABSTRACT

Active Handout:Shawn M. Regis

http://abstract.rsna.org/uploads/2016/16005104/Active RCB45 Lahey presentation v3.pdf

ED003-TH

Chest Thursday Case of the Day

Thursday, Dec. 1 7:00AM - 11:59PM Room: Case of Day, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants

Santiago E. Rossi, MD, Capital Federal, Argentina (*Presenter*) Advisory Board, Koninklijke Philips NV; Speaker, Pfizer Inc; Speaker, Boehringer Ingelheim GmbH; Royalties, Springer Science+Business Media Deutschland GmbH
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Fernando R. Gutierrez, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Kimberly G. Kallianos, MD, San Franicsco, CA (*Abstract Co-Author*) Nothing to Disclose
Graham M. Wallace, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Bram Geurts, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC
Agustina Agnetti, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lekshmi Santhosh, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) To analyze interesting chest cases. 2) To understand appropriate differential diagnosis. 3) To understand the clinical significance of the diagnosis presented.

Honored Educators

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Santiago E. Rossi, MD - 2015 Honored Educator
Travis S. Henry, MD - 2016 Honored Educator

RC601

Imaging of Thoracic Neoplasms: Update 2016 (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: E353C

CH OI

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

Participants
Edith M. Marom, MD, Ramat Gan, Israel, (edith.marom@gmail.com) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC601A Thoracic Lymphoproliferative Disorders

Participants
Sam S. Hare, MBBS,FRCR, London, United Kingdom, (samhare@nhs.net) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe native pulmonary lymphoid tissue with emphasis on MDCT appearances of intrapulmonary lymph nodes.2) Provide a simple classification system for the pulmonary lymphoproliferative disorder spectrum.3) Identify the breadth of MDCT patterns associated with pulmonary lymphoproliferative disease.4) Contrast the imaging manifestations of LIP versus pulmonary lymphoma.5) Detect key MDCT patterns in secondary pulmonary lymphoma.6) Differentiate lymphoproliferative malignancy in the immunocompromised patient (eg AIDS-related lymphoma; PTLD).

ABSTRACT

Pulmonary lymphoproliferative disorders (LPD) comprise a complex group of focal or diffuse abnormalities: benign LPD and primary pulmonary lymphoma are relatively rare whereas secondary pulmonary lymphoma is far more common. Understanding the spectrum of LPD, coupled with the diversity of potential imaging findings, is crucial because the radiologist is often the first to suggest the diagnosis and is therefore pivotal in differentiating these entities. This presentation will discuss practical LPD concepts relevant to everyday chest imaging by reviewing the more commonly encountered CT patterns in this disorder spectrum.

RC601B Thoracic Oncologic Imaging: Treatment Effects and Complications

Participants
Brett W. Carter, MD, Houston, TX, (bcarter2@mdanderson.org) (*Presenter*) Editor, Reed Elsevier;

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Brett W. Carter, MD - 2015 Honored Educator

RC601C Imaging Thymic Epithelial Malignancies

Participants
Edith M. Marom, MD, Ramat Gan, Israel, (edith.marom@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify an incidental thymic epithelial malignancy. 2) Apply the most appropriate imaging modality for the evaluation of thymic epithelial malignancies. 3) Assign the newly proposed TNM stage to a newly diagnosed thymic epithelial malignancy.

ABSTRACT

Honored Educators

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Edith M. Marom, MD - 2015 Honored Educator

RC601D Lung Cancer Staging: Update 2016

Participants
Travis S. Henry, MD, San Francisco, CA (*Presenter*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd

LEARNING OBJECTIVES

1) Understand the pratical role of imaging in the staging of lung cancer. 2) Identify findings that should be part of an imager's search pattern for accurate staging of lung cancer. 3) Recognize upcoming changes to the 8th edition of the TNM lung cancer staging.

ABSTRACT

Active Handout:Travis S. Henry

http://abstract.rsna.org/uploads/2016/16000700/rc601d Handout - Henry - Lung Cancer Staging.pdf

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Travis S. Henry, MD - 2016 Honored Educator

SSQ03

Chest (Miscellaneous/Infection)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E351

CH CT

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

FDA Discussions may include off-label uses.

Participants
Brett W. Carter, MD, Houston, TX (*Moderator*) Editor, Reed Elsevier;
John P. Lichtenberger III, MD, Bethesda, MD (*Moderator*) Author, Reed Elsevier

Sub-Events

SSQ03-01 Single Energy Scanning of Large Adult Patients: Can We Improve Image Quality with Spectral Shaping?

Thursday, Dec. 1 10:30AM - 10:40AM Room: E351

Participants
Martine J. Remy-Jardin, MD, PhD, Lille, France (*Abstract Co-Author*) Research Grant, Siemens AG
Rayyan A. Daghistani, MBBS, Lille, France (*Presenter*) Nothing to Disclose
Jean-Baptiste Faivre, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jessica Giordano, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Suonita Khung, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jacques Remy, MD, Mouvaux, France (*Abstract Co-Author*) Research Consultant, Siemens AG

PURPOSE

To evaluate the image quality of single-energy CT with tin filtration in routine chest CT examinations of large adult patients.

METHOD AND MATERIALS

50 consecutive patients with a BMI >25 kg/m2 (overweight patients : n=25 ; obese patients : n=25) underwent two successive non-contrast chest CT examinations for the follow-up of a chronic respiratory disease : (a) the first examination was obtained with a second-generation dual-source CT with an individually-adapted selection of the kilovoltage according to the patient's body weight (70-80 kg b.w.: 100 kV/65 mAs; 80-100kg b.w.: 120 kV/65 mAs; >100 kg: 140 kV/90 mAs) (Group 1) ; (b) the second examination was performed with a third-generation dual-source CT at 150 kV with tin filtration (150 Sn kV/200 mAs) (Group 2) to maintain the radiation exposure constant. In both groups, chest examinations were performed in single-energy, helical mode with a systematic use of milliamperage modulation; images were reconstructed with the same strength of iterative reconstruction (Group 1: SAFIRE; Group 2: ADMIRE; strength=3). Between T0 and T1, the patient's weight was stable (±5kg) and the severity of the underlying disease was not dramatically modified.

RESULTS

In Group 1: (a) CT examinations were obtained at 100 kV (n=4; 8%), 120 kV (n=30; 32%) and 140 kV (n=16; 32%) with a single X-ray tube; (b) the overall image quality was diagnostic with a subjective noise rated as mild to moderate on lung and mediastinal images; (c) the mean DLP was 168 ± 56.6 mGy.cm. Compared to Group 1, Group 2 examinations were characterized by (a) a significantly lower mean objective noise (14.51 ± 2.95 HU vs 19.5 ± 4.96 HU; p<0.0001) despite a non-significant difference in the mean DLP (167.3 ± 23.13 mGy.cm; p=0.89); (b) a better SNR (3.46 ± 0.91 vs 2.41 ± 0.67; p<0.0001); (c) a significantly lower score of subjective image noise (1.22 ± 0.16 vs 1.27 ± 0.19; p=0.008); (d) all but 4 examinations were acquired with a dual-source, high pitch mode.

CONCLUSION

Chest scanning at 150 Sn Kv improves the overall image quality in overweight and obese patients with no dose penalty.

CLINICAL RELEVANCE/APPLICATION

With third-generation DSCT, scanning large patients at 150 kV with tin pre-filtration improves the overall image quality of examinations without increasing the radiation exposure.

SSQ03-02 Age-Stratified Patterns of Thymic Involution on MDCT

Thursday, Dec. 1 10:40AM - 10:50AM Room: E351

Awards
Student Travel Stipend Award

Participants
Michael Drabkin, MD, East Meadow, NY (*Presenter*) Nothing to Disclose
John I. Meyer, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose
Nalini Kanth, MD, Roslyn, NY (*Abstract Co-Author*) Nothing to Disclose
Shari Lobel, MD, Woodbury, NY (*Abstract Co-Author*) Nothing to Disclose
Julia Grossman, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose
John H. Krumenacker JR, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the prevalence and appearance of normal thymic tissue stratified by age via MDCT.

METHOD AND MATERIALS

After IRB approval, we prospectively reviewed CT scans of the thorax from 600 consecutive trauma patients, age 30 to 69, utilizing MDCT at our level-one trauma center.We systematically recorded the prevalence and characteristics of thymic tissue in all 600 patients. We documented thymic morphology, dimensions, and density. Thymic tissue was characterized as absent, mostly fatty, an even mixture of fatty tissue and stranding, predominantly stranding, or discrete thymus. Thymic tissue density measurements were then obtained utilizing a fixed area ROI. CT scans were interpreted by three body fellowship-trained attending radiologists.Patient demographic data and histories were thoroughly documented. Patients with CT findings of thoracic trauma or other major trauma were excluded to eliminate the possibility of confounding mediastinal hemorrhage. Any conditions known to cause an abnormal appearance of the thymus, including but not limited to myasthenia gravis, thyrotoxicosis, lymphoma, bone marrow hyperplasia, ulcerative colitis, chemotherapy, and HIV were also excluded from the study.

RESULTS

Six hundred patients were evaluated. Seventy-two were excluded. Of the 528 remaining patients, 276 (53%) were found to have some residual thymic tissue. Of these 276, 100 (36%) had predominantly fatty replacement, 88 (32%) had an even mixture of fat and soft tissue, 68 (25%) were predominantly composed of soft-tissue, and 20 (7%) had a discrete well-defined thymus. The average thymic ROI values for these subsets were -54, -26, +4, and +47 HU, respectively.Interestingly, 40% of patients over the age of 40 were found to have residual thymic tissue, including 25% of patients in their 7th decade.

CONCLUSION

Our results demonstrate that residual thymic tissue is present more frequently and at later ages than previously reported.

CLINICAL RELEVANCE/APPLICATION

Failure to recognize residual thymic tissue as a normal finding may result in misinterpretation as a mediastinal mass, hemorrhage or infection.

SSQ03-03 Thoracic Cavity Volume Change after Lung Transplantation according to the Underlying End-State Lung Disease

Thursday, Dec. 1 10:50AM - 11:00AM Room: E351

Participants
Chul Hwan Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Donghyun Hong, MS, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Da Hyun Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Tae Hoon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

End stage lung diseases change the anatomy of the thoracic cavity, which is termed 'disease-related chest remodeling'. After lung transplantation (LTx), reverse remodeling to normal thoracic cavity volume might occur. However, clinical evidence in support of reverse remodeling is limited. Therefore, the aim of this study was to evaluate the change in thoracic cavity volume following LTx, in relation to the underlying end-stage lung disease.

METHOD AND MATERIALS

One hundred two patients, who underwent LTx between July 1996 and October 2014, were reviewed. In this retrospective study, 43 patients (Male:Female = 20:23, mean age = 45.5 ± 13.4 years) who underwent a pre-operative pulmonary function test (PFT), pre-operative chest computed tomography (CT), and a 1-year follow-up chest CT examination were enrolled. These patients were divided into three groups based on the pre-operative PFT results: Group I, obstructive disease (FEV1/FVC ratio < 70% and FVC ≥ 80%); Group II, restrictive disease (FEV1/FVC ratio ≥ 70% and FVC < 80%); Group III, mixed disease (FEV1/FVC ratio < 70% and FVC < 80%). Anatomical lung volumes were obtained from pre-operative CT and 1 year follow-up CT images using an auto-segmentation technique, with a default range from -200 to -1024 HU. The pre-operative and post-operative lung volumes were compared based on the underlying lung disease, and the change in the lung volumes was analyzed.

RESULTS

Among the 43 patients, 8 were assigned to group I, 23 to group II, and 12 to group III. In group I, post-LTx lung volume after 1 year was significantly smaller than pre-LTx lung volume (pre: 4032 ± 817 ml, post: 3086 ± 250 ml, p = 0.008). In group II, post-LTx lung volume was significantly larger than pre-LTx lung volume (pre: 2257 ± 764 ml, post: 3109 ± 1069 ml, p = 0.001). However, pre-LTx and post-LTx lung volumes were not significantly different in group III (pre: 3907 ± 1274 ml, post: 3710 ± 1056 ml, p = 0.365).

CONCLUSION

Following LTx, the change in thoracic cage volume is different and depends on the end-stage lung disease. This result supports the hypothesis of reverse remodeling of thoracic cavity following LTx, which reverses the effects of end-stage chest remodeling.

CLINICAL RELEVANCE/APPLICATION

Reverse remodeling could be one of the imaging biomarkers for assessing the prognosis after lung transplantation.

SSQ03-04 Incidence of Dendriform Pulmonary Ossification (DPO) in Usual Interstitial Pneumonia (UIP) on Chest Computed Tomography (CT)

Thursday, Dec. 1 11:00AM - 11:10AM Room: E351

Participants
Temphon Kruamak, Seattle, WA (*Presenter*) Nothing to Disclose
Stephanie Cheng, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Jitesh Ahuja, MD, MBBS, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Gregory Kicska, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Sudhakar N. Pipavath, MD, Mercer Island, WA (*Abstract Co-Author*) Consultant, Boehringer Ingelheim GmbH; Advisor, Boehringer

Ingelheim GmbH; Speaker, Boehringer Ingelheim GmbH
J. D. Godwin, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Eric J. Stern, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dendriform pulmonary ossification (DPO) is an uncommon condition, characterized by mature bone formation in the lung parenchyma, typically in the clinical setting of pulmonary fibrosis. CT scan appearance is described as linear branching calcifications within areas of lung fibrosis. In our experience, the reported incidence of DPO with thin section chest CT scanning (6.7%) is more common than the literature suggests. The purpose of this study was to assess the utility of maximum intensity projection (MIP) images for improving detection of DPO.

METHOD AND MATERIALS

We retrospectively analyzed HRCT images obtained from 210 patients (125 males, 85 females; mean age, 66.8 years 10.2 ± [SD]; range, 20-93 years) with UIP features on HRCT. There were 152 (72.4%) patients with idiopathic UIP and 58 (27.6%) patients with non-idiopathic UIP. The standard thin-section chest CT imaging and MIP imaging were separately evaluated by two radiologists with regard to presence or absence of DPO.

RESULTS

DPO was identified in 61 of 210 (29.0%) patients on standard thin-section CT images and in 125 of 210 (59.5%) patients on MIP images. DPO was more common in men than woman, and occurred more frequently in patients older than 60 years of age. DPO was observed more frequently in lower lobes (68.0%) than upper lobes (3.2%) or diffusely (28.8%). The presence of DPO was more common in patients with idiopathic UIP than patients with non-idiopathic UIP ($p<.05$). Junior reader had more confidence in DPO detection by MIP images than standard thin-section CT images.

CONCLUSION

DPO is more common in patients with pulmonary fibrosis than previously described in the literature, noted in 59.5% of our patients with UIP. MIP images can greatly improve detection and confidence in diagnosis of DPO compared to standard thin-section CT images.

CLINICAL RELEVANCE/APPLICATION

DPO is more common in patients with pulmonary fibrosis than previously described in the literature. MIP images can improve detection of DPO compared to standard thin-section CT images.

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J. D. Godwin, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2015 Honored Educator

SSQ03-05 CT and Pathology Correlation Predicts Survival in Interstitial Pneumonia with Autoimmune Features (IPAF)

Thursday, Dec. 1 11:10AM - 11:20AM Room: E351

Participants
Jonathan H. Chung, MD, Chicago, IL (*Presenter*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
Steven M. Montner, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Aliya N. Husain, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Justin Oldham, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ayodeji Adegunsoye, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Cathryn Lee, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Heber MacMahon, MD, Chicago, IL (*Abstract Co-Author*) Consultant, Riverain Technologies, LLC; Stockholder, Hologic, Inc; Royalties, UCTech; Research support, Koninklijke Philips NV; Consultant, General Electric Company
Imre Noth, MD, Chicago, IL (*Abstract Co-Author*) Speakers Bureau, Sumitomo Dainippon Pharma Co, Ltd; Speakers Bureau, F. Hoffmann-La Roche Ltd ; Speakers Bureau, Boehringer Ingelheim GmbH; Consultant, ImmuneWorks, Inc; Consultant, Gilead Sciences, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Boehringer Ingelheim GmbH
Rekha Vij, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Mary Strek, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT and pathology correlation has been shown to predict survival in well-defined connective tissue diseases. The purpose of the current study was to determine whether the same phenomenon is present in those with IPAF.

METHOD AND MATERIALS

The earliest HRCT-quality chest CT scans from subjects with IPAF were analyzed by 2 chest radiologists. The predominant distribution of lung disease as well as the extent of reticular abnormality, honeycombing, ground-glass opacity, air-trapping, and traction bronchiectasis were scored. The CT UIP pattern (inconsistent, possible, definite) was also determined as well as the single best diagnosis with level of confidence. Pathological samples were analyzed by a lung pathologist for UIP pattern as per guidelines. The survival in the 3 combinations of concordant and discordant CT and pathology scores for UIP diagnosis were assessed using a Cox model.

RESULTS

There were 78 subjects with both CT and pathology for review. In regard to pathology, there were 19 (24.4%) with a non-UIP

There were 78 subjects with both CT and pathology for review. In regard to pathology, there were 19 (24.4%) with a non-UIP pattern and 59 (75.6%) with a UIP pattern. CT UIP pattern was as follows: UIP (34, 43.6%), possible UIP (18, 23.1%), and inconsistent with UIP (26, 33.3%). CT UIP, CT possible UIP, and CT inconsistent with UIP were associated with pathological UIP in 91.2%, 83.3%, and 50% of subjects; respectively. Those with concordant not UIP/inconsistent with UIP patterns had significantly better survival than those with discordant UIP or concordant UIP diagnoses (p-value 0.02).

CONCLUSION

CT and pathology correlation has value as a predictor of survival in IPAF. Those with CT possible UIP have a high rate of UIP diagnosis on pathology.

CLINICAL RELEVANCE/APPLICATION

There is value of CT and pathology correlation beyond diagnosis. Those with CT possible UIP likely have UIP on pathology and may not require biopsy in the correct clinical setting.

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Jonathan H. Chung, MD - 2013 Honored Educator

SSQ03-06 Thermal Imaging as a Diagnostic Tool for Bacterial Pneumonia

Thursday, Dec. 1 11:20AM - 11:30AM Room: E351

Participants
Linda T. Wang, MD, Boston, MA (*Abstract Co-Author*) Employee, Vertex Pharmaceuticals Incorporated; Stockholder, Vertex Pharmaceuticals Incorporated
Robert H. Cleveland, MD, Boston, MA (*Presenter*) Research Consultant, Alexion Pharmaceuticals, Inc; Editor, Springer Science+Business Media Deutschland GmbH; Research Consultant, Biomedical Systems;
Robert G. Zwerdling, MD, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose
Thomas Ptak, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Mindy Sherman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Kenan Haver, MD, Boston, MA (*Abstract Co-Author*) Spouse, Employee, Vertex Pharmaceuticals Incorporated;
William D. Binder, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Pallavi Sagar, MBBS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Patricia Hibberd, MD,PhD, Boston, MA (*Abstract Co-Author*) Spouse, Employee, General Electric Company

PURPOSE

Assess feasibility of thermal imaging (TI) to diagnose bacterial pneumonia.

METHOD AND MATERIALS

Subjects were patients presenting to the hospital's emergency department with possible bacterial pneumonia who received a chest x-ray (CXR) during the evaluation. TI of the chest were obtained within 4 hours of the CXR. CXR and TI were separated and then assessed in blinded random order. Presence of a focal opacity on CXR and presence of an area of increased heat on TI were each considered consistent with bacterial pneumonia and recorded. CXR served as the outcome parameter against which the TI was compared.

RESULTS

47 patients were enrolled; 15 in a training set and 32 in a Test Set with 28M/3F (one excluded, having no usable TI), ages 10 months to 82 years, 23 adults, 8 children. There was one false negative TI. Sensitivity=0.8, specificity=0.58. False positive rate=0.42, false negative rate=0.20. Positive predictive value=0.29, negative predictive value=0.94. Statistical power=0.26. In order to achieve a power of 0.80 with the conditions encountered in this study, 138 patients would be required. The difference in proportion of positive TI and positive CXR was 32% for the adult (p=0.04), and 20% for the pediatric (p=0.50) subgroups, both favoring TI. A non-blinded review of cases where CXR/TI did not agree (this review was not included in the statistical analysis) suggests that TI may be able to detect bacterial pneumonia when the CXR is confounded by chronic disease, poor technique, atelectasis or early/late evolution of an opacity.

CONCLUSION

This feasibility study confirms the proof of concept that thermal imaging of the chest can demonstrate bacterial pneumonia. Although significantly underpowered, this study supports further investigation with larger trials of both adult and pediatric patients.

CLINICAL RELEVANCE/APPLICATION

This technology is potentially most useful in resource limited environments where pneumonia is the second most common cause of death in young children and where CXR equipment and expert readers are unavailable. It also could be of benefit in high throughput healthcare settings, such as emergency departments or busy doctors' offices and particularly in rural areas where access to CXR is limited.

SSQ03-07 Human Metapneumovirus Pneumonia: Clinical Characteristics and Computed Tomography Findings

Thursday, Dec. 1 11:30AM - 11:40AM Room: E351

Participants
Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Kyung-Hyun Do, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Ho Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Young Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical and computed tomography (CT) findings in adults who had proven human Metapneumovirus (HMPV) pneumonia

METHOD AND MATERIALS

We included 850 consecutive adults who had proven HMPV pneumonia between January 2010 and February 2016. Patients with co-infection or who had no evidence of pneumonia on CT were excluded. Clinical findings including monthly distribution of the number of patients, patients' immune status, and clinical course were recorded. CT findings were assessed for the distribution of parenchymal abnormalities, percent extent of centrilobular nodules, consolidation and ground-glass attenuation, presence of macronodules, bronchial wall thickening, bronchiectasis, lymphadenopathy and pleural effusion were reviewed. CT findings of patients with hospital stay over 7 days were compared to those with less than 7 days.

RESULTS

A total of 143 patients (M : F = 86 : 57, mean age 60.4 years) were included for analysis. Of these, 55 patients were immunocompromised condition. Nasopharyngeal specimen RT-PCR was performed in 137 patients, and six patients underwent bronchoscopic bronchoalveolar lavage (BAL) for testing respiratory viruses by BAL fluid RT-PCR. HMPV pneumonia predominated from March to May, and mean hospital stay was 11 days. Bilateral lung involvement was present in 105 (73%) patients. Dominant CT patterns were characteristic ill-defined small centrilobular nodules (75%) with bronchial wall thickening (87%) and ground-glass attenuation (86%). The patterns do not significantly differ between immunocompromised and immunocompetent patients. The extent of consolidation and ground-glass attenuation were larger and macronodules and pleural effusion were frequently noted in patients who need longer hospital stay. Six (4%) patients were died.

CONCLUSION

HMPV pneumonia usually presents ill-defined small centrilobular nodules with bronchial wall thickening and ground-glass attenuation. The extent of consolidation and ground-glass attenuation were the independent factors to affect longer hospital stay.

CLINICAL RELEVANCE/APPLICATION

This study provides characteristic CT findings of HMPV pneumonia using a large patient population. The detection of these findings will be useful for differentiating HMPV pneumonia from other viral pathogen or bacterial pneumonia to make an appropriate diagnosis and treatment.

SSQ03-08 Results of Quantitative Chest-CT in Chronic Pulmonary Graft-vs-Host Disease (cGvHD) Three Years after Allogeneic Stem Cell Transplantation

Thursday, Dec. 1 11:40AM - 11:50AM Room: E351

Participants
Christopher Kloth, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Wolfgang M. Thaiss, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Juergen Hetzel, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Georg Bier, MD, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Wirths, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Marius Horger, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify lung parenchymal changes in symptomatic patients with chronic pulmonary graft-versus-host disease three years after allogeneic stem cell transplantation (allo-SCT) by means of CT-densitometry [CTD] and to compare results with those of established pulmonary function tests (PFT).

METHOD AND MATERIALS

The study group consisted of 26 patients with pulmonary cGvHD (19 male, 7 female; mean age 49.29 ± 15.89; range 19-72 years). The diagnosis was based on clinical symptoms, PFT and chest-CT findings. CTD and PFT were performed both in the pre- and post-transplantation setting and results compared with each other. CT scans were obtained during suspended deep inspiration including the whole lungs. The mean lung attenuation (MLD), low attenuation values (LAV) and distribution of focal parenchymal abnormalities compatible with emphysema (HU<-950) were quantitatively calculated with histograms and graphics. On PFT, total lung capacity (TLC), residual volume (RV), vital capacity (VC), forced expiratory volume in 1s (FEV1s) and diffusion capacity for carbon monoxide (DLCOSB.) were registered.

RESULTS

Changes in end-inspiratory lung volume and density (MLD and LAV) in symptomatic cGvHD patients in mean three years after allo-SCT proved all not significant, but there was a clear trend towards an increase in lung volume and a decrease in lung attenuation. These results were similar throughout all classes of bronchiolitis obliterans (BO) by cGvHD.PFT showed a significant decrease in VC, FEV1s but only a minimal decrease in DLCOSB. Changes in FVC after stem cell transplantation correlated with changes in LAV ($r=0.649$, $p=0.031$). Predicted VC correlated with changes in LAV ($r = 0.771$, $p = 0.005$). There was a correlation between the absolute difference of FEV1 and DLCOSB. ($r = 0.64$, $p = 0.14$) before and after stem cell transplantation.

CONCLUSION

End-inspiratory phase CT lung parenchyma quantification in symptomatic patients with pulmonary cGvHD three years after allo-SCT shows discrete changes over the pre-transplantation setting representing airway obstruction, mirroring airflow limitation on PFT, with no significant abnormalities compatible with lung parenchymal destruction (emphysema).

CLINICAL RELEVANCE/APPLICATION

CT-quantification of lung volume and density (attenuation) in cGvHD is now available as a post-processing tool for most CT-scanners this additionally gained information might be helpful for diagnosis of cGvHD.

SSQ03-09 Critical Evaluation of Lung Ultrasound findings Compared with Dynamic Computed Tomography: Preliminary Data

Thursday, Dec. 1 11:50AM - 12:00PM Room: E351

Participants
Alice Wielandner, MD, Vienna, Austria (*Presenter*) Nothing to Disclose
Constanze Bardach, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Prerana P. Agarwal, DMRD, MBBS, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Florian Thuerk, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Frederic Tomboel, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Eugenijus Kaniusas, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Christina Braun, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Stefan Boehme, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Christian J. Herold, MD, Vienna, Austria (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Agfa-Gevaert Group; Research Grant, Bracco Group; Research Grant, Guerbet SA; Speakers Bureau, Bayer AG; Speakers Bureau, Bracco Group; Stockholder, Hologic, Inc
Helmut Prosch, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Data on correlation of lung ultrasound (LUS) findings in critical ill patients such as "B-lines" and consolidations with the imaging gold standard Computed Tomography (CT) is scarce.
The aim of the study was to correlate B-line count and extent of consolidation in LUS with dynamic CT at predefined Positive End Expiratory Pressure (PEEP) levels in healthy and diseased piglets.

METHOD AND MATERIALS

After Ethic commetee´s approval, 6 piglets were studied during pressure controlled mechanical ventilation at PEEP level 0,5,15 before and after surfactant depletion injury. At each PEEP level inspiratory, expiratory and dynamic CT scans (Siemens E16) and ultrasound examinations (Mindray M7) were performed by the same radiologist on both sides (curved transducer 3.5 MHz, obliqu./transv.orientation, 5th/6th intercostal space ventral/ dorsal and transv.subcostal in the anterior axillary line).
In offline evaluation of the ultrasound clips, image quality, B-line count and if present consolidations were evaluated. Evaluation of the corresponding dynamic/ CTs was performed blinded to the LUS findings.

RESULTS

Excellent correlation of dynamic changes in lung consolidations between CT and ultrasound was shown (R= 0.9). Higher B-line counts were observed in the diseased lungs (compared with healthy). In the healthy and the diseased lungs, B-line count decreased with increase of PEEP and more B-lines were present dorsally. No distinct CT correlate for the B-lines could be found.

CONCLUSION

Ultrasound estimation of the consolidation volume has an excellent correlation with CT therefore proved also in comparison with the imaging gold standard to be a reliable tool to assess changes in consolidations during modification of the respiratory management. Evaluation of B-lines is increasingly used in emergency medicine and pediatrics. The relevance and origin of is still subject of debate. Our results show that B-lines are PEEP and position dependent and that there seems to be no correlate of this ultrasound artefacts in CT.

CLINICAL RELEVANCE/APPLICATION

CT correlation with LUS findings offers a new perspective in the understanding, application and interpretation of LUS. The results of this study might help to adapt the respiratory management of critically ill patients.

SSQ04

Chest (Thoracic Malignancy)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S402AB

CH CT MR

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

FDA Discussions may include off-label uses.

Participants
Patricia M. de Groot, MD, Houston, TX (*Moderator*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Moderator*) Nothing to Disclose

Sub-Events

SSQ04-01 Clinicoradiological Implications of the New Proposals for TNM (8th Edition) of Non-small Cell Lung Cancer: Overall Stage and T Descriptor Migration in 202 Consecutive Patients

Thursday, Dec. 1 10:30AM - 10:40AM Room: S402AB

Participants
Sarah L. Sheard, MBBS, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sisa Grubnic, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Siobhan J. Green, MBBS, 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;

PURPOSE

To compare in a clinical setting the proposed TNM UICC 8th edition (UICC8) staging and the current TNM UICC 7th edition (UICC7), to determine:1. TNM reclassification patterns,2. Stage migration and3. Implications for management.

METHOD AND MATERIALS

202 consecutive prior cases of new lung cancer presentations and confirmed NSCLC were identified at a tertiary cancer center. Staging MDCT studies were re-interpreted by consensus by 3 expert thoracic radiologists in corroboration with other concurrent imaging modalities, cytopathological and clinical records to determine TNM staging under UICC8 and also classified according to the current UICC7. All TNM descriptors were recorded. Patterns of T and M descriptor migration, staging group changes and potential implications for previous operability thresholds (Stage IIIA/IIIB) were evaluated.

RESULTS

The distribution of T stage in UICC 8 v UICC7 would be as follows: Tx 1% v 1%; T1a 1% v 5%;T1b 4% v 3%;T1c 3% v N/A;T2a 20% v 28%;T2b 5% v 5%;T3 17% v 28%;T4 47% v 29%. UICC8 would result in a significant increase in T4 and reduction in T3 classified disease (both $p<0.01$, chi-square). M1 disease descriptors remain static in UICC8 (58% overall: M1a 21%, M1b 6%, M1c 30%).Stage distribution according to UICC8 v UICC 7 respectively would be as follows: IA 5% v 6% (new subgroups IA1:1%, IA2:3%, IA3:1%); IB 6 v 7%; IIA:0% v 7%; IIB:10% v 4%; IIIA:6% v 11%; IIIB:11% v 7%; IV:58% v 58% (new subgroups IVA:28%,IVB:30%). No significant changes in stage distribution ($p>0.05$).The proportion of patients with IIIA or better, potentially operable disease, decreases non-significantly from 35% to 28% ($p>0.05$).

CONCLUSION

In clinical practice IALSC UICC8 proposals would create migration of cases from T3 to T4 category, but this does not cause significant change in the overall staging distribution or potential eligibility for aggressive management.

CLINICAL RELEVANCE/APPLICATION

Unlike the clinically impacting stage migrations occurring from UICC6 to UICC7, new UICC8 changes appear more minor affecting T3-4 disease distribution but not overall stage prevalence significantly.

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/

Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

SSQ04-02 Pretreatment FDG-PET Standardized Uptake Values and Tumor Size in Medically Inoperable NSCLC is Prognostic of Overall Two-Year Survival after Stereotactic Body Radiation Therapy

Thursday, Dec. 1 10:40AM - 10:50AM Room: S402AB

Awards
Trainee Research Prize - Medical Student

Participants
Madison Kocher, BS, Charleston, SC (*Presenter*) Nothing to Disclose
James G. Ravenel, MD, Charleston, SC (*Abstract Co-Author*) Consultant, Imbio, LLC

Elizabeth Garrett-Mayer, PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Anand K. Sharma, MD, Charleston, SC (*Abstract Co-Author*) Speakers Bureau, Bristol-Myers Squibb Company Speakers Bureau, sanofi-aventis Group

PURPOSE

To determine the prognostic value of initial tumor size and metabolic activity on overall two-year survival for patients with early stage lung cancer receiving stereotactic body radiotherapy (SBRT) with curative intent.

METHOD AND MATERIALS

We retrospectively reviewed 100 consecutive patients from 2008-2013 who underwent SBRT and underwent PET/CT at our institution within 2 months prior to treatment. FDG-PET scans were acquired after the patient had fasted for 6 hours and had a confirmed blood glucose of lower than 200 mg/dl. 18F-FDG 3.5 MBq/kg body weight was administered via intravenous injection. PET/CT (GE Discovery ST PET/CT, GE Health Care, Waukesha, WI) was acquired 45 minutes after FDG administration. For each tumor, tumor diameter, tumor volume, SUVmax, SUV average, and the SUV volume were obtained on a GE AW1 workstation. Survival was determined by the electronic medical record. For those without a definitive outcome at two years, vital status was confirmed through the National Death Index. Cox regression analyses with overall survival (OS) as the outcome were performed to estimate hazard ratios (HR) for tumor size and metabolic activity. A multiple regression model was used to evaluate interactions between size and metabolic parameters.

RESULTS

There were 37 females and 63 males with a median age of 75 (range 51-95). OS was improved for tumors < 2cm compared with > 2cm (HR 1.64; p=0.092) and for tumors with SUVmax < 5 compared with >5 (HR 1.95; p=0.041). Using multiple regression models, only tumors > 2 cm and > 5 SUVmax were shown to have inferior 2-year survival (Figure 1) compared to those with neither factor.

CONCLUSION

Early stage lung cancer patients treated with curative intent SBRT with large (>2cm) tumors and >5 SUVmax have poorer survival outcomes compared to patients with neither or only one of those factors.

CLINICAL RELEVANCE/APPLICATION

Combining size and metabolic parameters improves survival prediction in patients treated with curative intent SBRT and may allow selection of populations that would benefit from additional therapy.

SSQ04-04 Utility and Reproducibility of 3-Dimensional Printed Models in Pre-Operative Planning of Superior Sulcus Tumors

Thursday, Dec. 1 11:00AM - 11:10AM Room: S402AB

Awards
Trainee Research Prize - Resident

Participants
Elizabeth George, MD, Boston, MA (*Presenter*) Nothing to Disclose
Maria F. Barile, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Steven Mentzer, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael Jaklitsch, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Andetta R. Hunsaker, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Dimitris Mitsouras, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Corporation;
Ory Wiesel, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Antonio Coppolino, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Andreas Giannopoulos, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility of 3D printing of superior sulcus (Pancoast) tumors for pre-operative planning using a radiology-centric workflow.

METHOD AND MATERIALS

Tumor, bones and systemic and pulmonary vasculature were 3D-printed from staging chest CT for two Pancoast tumor patients. Segmentation used a commercial 3D workstation (Vitrea 6.7, Vital Images). Post-processing to introduce connecting elements to allow isolated tissues to remain in one piece and maintain their spatial relationship after printing (Figure) used FDA-approved 3D-printing software (3-matic, Materialise). Models were provided to operating surgeons (n=4) prior to the procedure. Following the procedure, surgeons assessed aspects of model utility using the Gillespie score scale (1=inferior; 2=similar; 3=information assimilated more rapidly; 4=additional information provided). Inter-observer variability for one model generated by 2 independent readers was assessed using quantitative metrics (tumor volume, area of adjacent tissues 1 mm from the tumor, and the Dice similarity index for each tissue), and subjectively by the surgeons based on intra-operative findings.

RESULTS

Printed models were superior to cross-sectional imaging and 3D visualization for surgical planning (score=3.21). The highest scores were given for determining the surgical approach (=4), evaluating the relationship of tumor to vessels (=3.5), and assessing resectability (=3.5); the lowest score (=2) was given for guiding instrumentation selection. Model accuracy was deemed good to excellent compared to intra-operative findings. Interobserver variation was <15% in tumor volume and <1.8 cm2 in tissue areas within 1mm of the tumor. Dice similarity indices were >93.4% for vasculature and >86.5% for tumor and bone. Surgeons noted small differences in accuracy between the two models, with no difference in clinical utility.

CONCLUSION

Pancoast tumors are particularly challenging for surgeons due to the extensive involvement of adjacent vital structures. 3D-Printed models generated with a radiology-centric workflow have clinically negligible variability, are sufficiently accurate, and benefit surgical planning for Pancoast tumor patients.

CLINICAL RELEVANCE/APPLICATION

Juxtaposing the effort and cost of 3D-printing Pancoast tumor models versus surgeons' perceived enhancement to procedure planning, 3D printing should be considered for surgical planning.

SSQ04-05 Prognostic Value of CT Phenotype in Stage IV EGFR-Mutation-Positive Non-Small Cell Lung Cancer Undering Tyrosine Kinase Inhibitors

Thursday, Dec. 1 11:10AM - 11:20AM Room: S402AB

Awards
Student Travel Stipend Award

Participants
Jiangdian Song, PhD, Shenyang, China (*Presenter*) Nothing to Disclose
Di Dong, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jie Tian, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

By a quantitative radiomics approach we provided a credible aided diagnosis for stage IV EGFR-mutation-positive NSCLC who undergo TKIs therapy. The phenotypic features selected from a predefined feature set can be conveniently used to facilitate the pre-therapy individualized decision of EGFR-TKIs in this disease.

METHOD AND MATERIALS

The proposed method has been evaluated on a clinical dataset including 80 stage IV NSCLC patients and a validation dataset including 72 stage IV EGFR-mutation-positive NSCLC patients. All patients have undergone the treatment of EGFR TKIs as the first-line or second-line treatment between Jan 1, 2012, and Dec 31, 2015.Patients who underwent resection for local advanced or metastatic disease were withdrawn from the study. The region of interest (ROI) was extracted manually by two radiologists. Progression-free survival (PFS) was used to evaluate the prognosis ability of the phenotypic features. PFS was defined as the time from the date of treatment to the date of confirmed tumour relapse.

RESULTS

The median PFS of all enrolled patients was 9.5 months (IQR 6.2–14.3). P values showed significantly difference between the low risk group and the high risk group patients according to the phenotypic features: "Root mean square of voxel (RMS)", "Contrast of co-occurrence (CO)" and "High gray level emphasis of run emphasis (HGLE)". Of these, Cox regression analysis indicated the risk of patients with higher RMS increased 1.69 times (primary set: HR: 1.69, 95%CI: 1.16-2.47, p=0.006; validation set: HR: 1.81, 95%CI: 1.50-3.16, p=0.001) compared with the lower patients. The higher HGLE indicated worse prognosis compared with the lower patients (primary set: HR: 1.58, 95% CI: 1.10-2.32, p = 0.015; validation set: HR: 2.30, 95%CI: 2.02-4.28, p=0.001). And the risk increased nearly 2 times of the lower CO group when compared with the patients with higher values(primary set: HR: 0.68, 95% CI: 0.47-0.88, p = 0.043; validation set: HR: 0.60, 95%CI: 0.41-0.90, p=0.012).

CONCLUSION

Our quantitative radiomics method could achieve the prognosis of EGFR-TKIs for the stage IV EGFR-mutation-positive NSCLC patients. The radiomics key features will be further expanded in larger data samples, which may provide more predictive information for clinical practice.

CLINICAL RELEVANCE/APPLICATION

Our findings potentially offer clinical value in directing personalized therapeutic regimen selection for stage IV EGFR-mutation-positive NSCLC patients.

SSQ04-06 Magnetic Resonance Elastography of the Primary Anterior Mediastinal Tumors: A Preliminary Study

Thursday, Dec. 1 11:20AM - 11:30AM Room: S402AB

Participants
Wei Tang, MD, Beijing, China (*Presenter*) Nothing to Disclose
Ning Wu, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Han Ouyang, MD, Bejing, China (*Abstract Co-Author*) Nothing to Disclose
Yao Huang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility of magnetic resonance (MR) elastography in characterizing stiffness of anterior mediastinal tumors.

METHOD AND MATERIALS

Institutional review board approval and informed consent were obtained. Twenty-one patients presenting with anterior mediastinal tumors were enrolled in the study. All the patients underwent MR examination consisting of diffusion-weighted imaging (DWI) and MR elastography on a 3.0 T whole body scanner. A circular or oval regions of interest (ROI) was placed on the tumor on DWI image shown its largest axial diameter, covering greater than 75% of the areas of the tumor. ROI then was copied to the corresponding elastogram at the same level for each lesion, and the measurement of stiffness value was automatically obtained and documented. Two-way ANOVA test was used to examine the difference of stiffness value with the correlation of pathological results.

RESULTS

In a total of 21 patients with anterior mediastinal tumors were pathologically confirmed with thymoma in 7, thymic carcinoma in 7, and primary lymphoma in 7. Higher average stiffness value of thymic carcinoma was measured as 6183.53 ± 2437.67 kPa, followed by 4506.49 ± 1234.56 kPa for thymoma, and 3586.04 ± 1084.80 kPa for lymphoma. Average stiffness value of thymic carcinoma was significantly higher than that of thymoma ($p = 0.006$) and lymphoma ($p = 0.000$). Meanwhile, average stiffness value of thymoma was significantly higher than that of lymphoma ($p = 0.018$).

CONCLUSION

This preliminary study demonstrates the feasibility of MR elastography in the evaluation of stiffness of anterior mediastinal tumors in various pathologies.

CLINICAL RELEVANCE/APPLICATION

MR elastography could be used to assess the characteristics of anterior mediastinal tumor as to its stiffness.

SSQ04-07 Diffusion-Weighted MR Imaging for Assessment of Mediastinal Masses

Thursday, Dec. 1 11:30AM - 11:40AM Room: S402AB

Participants
Marcelo K. Benveniste, MD, Houston, TX (*Presenter*) Nothing to Disclose
Brett W. Carter, MD, Houston, TX (*Abstract Co-Author*) Editor, Reed Elsevier;
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jia Sun, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Edith M. Marom, MD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Although diffusion weighted MR imaging (DWI) has been accepted as a valuable tool for malignancies, its role in the evaluation of anterior mediastinal masses has not been elucidated. The aim of this study was to evaluate the accuracy of DWI in distinguishing benign from malignant diseases and its performance in assessing thymic epithelial neoplasms (TEN).

METHOD AND MATERIALS

After approval by our institutional review board, we retrospectively reviewed 38 patients with an anterior mediastinal mass who were referred for a chest MRI. DWI images were performed with low- and high-b-values (b =0, 800 s/mm2) as well ADC maps. MRI analysis was performed qualitatively by one chest radiologist using apparent diffusion coefficient (ADC) measurements. Summary of ADC were provided in mean, SD, median, and range by different groups for each test (Table 1). Anterior mediastinal mass diagnosis was classified according to pathology diagnosis, and TEN were classified according to WHO classification and Masaoka-Koga staging system.

RESULTS

Of the 38 study patients, 26 had malignant lesions and 12 had benign lesions. Malignant lesions included: thymoma (n=21), thymic carcinoma (n=2), and one of each: teratoma, lymphoma, and schwannoma. Benign lesions included: lymphangiona (n=1), thymic and pericardial cyst (n=7) and thymic hyperplasia (n=4). Of the patients with thymomas, 11 patients had early disease (stage I/II) and 10 had advanced disease (stage III/IV). We found that mean ADC value was statistically significant in differentiating benign from malignant masses (3.63 SD0.80 vs 2.30, SD=0.0.75, p<0.001), benign thymic masses from TEN (3.63, SD=0.80 vs 2.19, SD=0.66, p<0.0001) as well as in differentiating TEN from non-thymic mediastinal neoplasms (2.19, SD=0.66 vs 3.19, SD=0.93, p=0.0261). However, ADC values could not be used to differentiate low-grade thymomas, high-grade thymomas and thymic carcinomas according to WHO classification and early from late stage thymomas per Masaoka-Koga Staging System.

CONCLUSION

Our study shows that DWI is a valuable tool in differentiating benign from malignant lesions in the anterior mediastinum and is helpful in the evaluation of newly diagnosed mediastinal masses.

CLINICAL RELEVANCE/APPLICATION

DWI MRI is a noninvasive, reliable, and reproducible imaging tool that helps in the assessment and differentiation of benign from malignant mediastinal masses.

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/

Brett W. Carter, MD - 2015 Honored Educator
Mylene T. Truong, MD - 2015 Honored Educator
Edith M. Marom, MD - 2015 Honored Educator

SSQ04-08 A Simple Computed Tomography Scoring System to Predict Histological Malignancy of Solitary Fibrous Tumors of the Pleura

Thursday, Dec. 1 11:40AM - 11:50AM Room: S402AB

Participants
Siegfried Helage, Paris, France (*Presenter*) Nothing to Disclose

PURPOSE

The aim of the present study was to define the very first score enabling discrimination between benign and malignant solitary fibrous tumors of the pleura (SFTPs), on the basis of reliable preoperative CT features.

METHOD AND MATERIALS

Between December 2004 and November 2012, 56 patients underwent complete resection for SFTP at six institutes. CT scans were reviewed retrospectively, and a diagnostic scoring system for predicting malignant SFTP preoperatively was designed.

RESULTS

Univariate analysis revealed seven significant predictors of malignant SFTP: tumor size ≥ 10 cm (p=0.002), tumor heterogeneity

spontaneously (p=0.019) or after contrast medium injection (p=0.029), existence of intratumoral fluid density areas (p=0.011), a pleural effusion (p=0.01), measurable (diameter >1 mm) intratumoral vessels (p=0.019), a hypervascular character (visible intratumoral vessels and/or intense enhancement) (p=0.001). A scoring system based on these seven CT features, each assigned 1 point, and with a cut-off of 4 points, could predict malignant SFTP with a specificity of 85% and a sensitivity of 48%.

CONCLUSION

Our scoring system using seven CT features (tumor size ≥ 10 cm, tumor heterogeneity with or without contrast injection, intratumoral fluid density areas, pleural effusion, measurable intratumoral vessels, and a hypervascular character of the tumor) may be helpful for predicting histological malignancy of solitary fibrous tumors of the pleura.

CLINICAL RELEVANCE/APPLICATION

Solitary fibrous tumors of the pleura (SFTPs) are very rare, if not exceptional, primary pleural neoplasms. Because of the vagueness of histopathological diagnosis, the only recommended treatment is complete excision of the tumor burden for all patients, notwithstanding tumor grade. Two stumbling blocks for this unequivocal therapeutic approach remain. Surgeons need valid arguments to justify an aggressive treatment in patients with comorbidities that increase anesthetic risk. Besides, considering radiation protection, a continued monitoring with CT after surgery should be supported by such arguments in relatively young patients. These arguments could be provided by CT features suggestive of histological malignancy on preoperative chest imaging. These CT features allowed us to build the very first computed tomography scoring system to predict preoperatively the malignant character of SFTPs.

SSQ04-09 A Comparison between Free-breathing Radial VIBE Combined BLADE in 3T MR and Endoscopic Ultrasound for Preoperative T Staging of Potentially Resectable Esophageal Cancer, with Histopathological Correlation

Thursday, Dec. 1 11:50AM - 12:00PM Room: S402AB

Participants
Jinrong Qu, Zhengzhou, China (*Presenter*) Nothing to Disclose
Zhaoqi Wang, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jia Guo, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the T staging of potentially resectable esophageal cancer (EC) using free-breathing radial VIBE (r-VIBE) combined BLADE and endoscopic ultrasound (EUS) with pathologic confirmation of the T stage.

METHOD AND MATERIALS

Patients with endoscopically proven EC and indeterminate T stage by CT and EUS were imaged on a 3T MR scanner, using post contrast r-VIBE with 1.0 mm spatial resolution combined BLADE. Two independent readers assessed image quality using a 5-point scale, and quantified the T-stage. One endoscopist assessed the T stage on EUS. The T stage for r-VIBE combined BLADE and EUS were compared with post-operative pathologic confirmation. Inter-reader agreement was also calculated.

RESULTS

40 patients were included. Inter-reader agreement of image quality and for T staging was good for both r-VIBE (Kappa=0.743 and Kappa=0.767, respectively; P<0.0001) and BLADE(Kappa=0.703 and Kappa=0.714, respectively; P<0.0001). Comparison between EUS and pathologic T staging had agreement of 80% (32/40). The T staging agreement between r-VIBE combined BLADE and pathologic T staging was 90.0% (36/40) for reader 1 and 95% (38/40) for reader 2, respectively. High accuracy for not only T1/T2 stage was obtained for both r-VIBE combined BLADE readers (92.5% and 100% for reader 1 and reader 2, respectively) and for EUS reader (100%), but also T3/T4, r-VIBE combined BLADE showed accuracy of 91.8% and 93.9% for reader 1 and reader 2, respectively, while for EUS, accuracy was 69.5% compared to pathologic T staging.

CONCLUSION

Contrast-enhanced free-breathing r-VIBE combined BLADE is comparable to EUS in T staging of potentially resectable EC.

CLINICAL RELEVANCE/APPLICATION

In patients with potentially resectable EC, contrast-enhanced free-breathing r-VIBE combined BLADE is able to depict the depth of tumor noninvasively, especially for patients with non-traversable lesions in which EUS is difficult to perform.

SSQ13

Nuclear Medicine (Breast/Chest Imaging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S504CD

BR CH CT MR NM

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

Participants
Matthias J. Eiber, MD, Muenchen, Germany (*Moderator*) Nothing to Disclose
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSQ13-01 Positron Emission Tomography (PET) Imaging of Chemokine Receptor CXCR4 in Patients with Breast Carcinoma: Initial Experience

Thursday, Dec. 1 10:30AM - 10:40AM Room: S504CD

Participants
Tibor Vag, MD, PhD, Munich, Germany (*Presenter*) Nothing to Disclose
Stephan Metz, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Katja Steiger, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes Ettl, Munchen, Germany (*Abstract Co-Author*) Nothing to Disclose
Markus Niemeyer, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Paepke, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans-Jurgen Wester, Munchen, Germany (*Abstract Co-Author*) CEO, SCINTOMICS GmbH
Markus Schwaiger, MD, Munich, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speaker, Siemens AG

PURPOSE

CXCR4 is a chemokine receptor that is overexpressed in several types of human cancers including breast cancer and seems to play crucial rule in the mechanism of metastasis. The aim of this proof of concept study was to evaluate the novel CXCR4 targeted Positron Emission Tomography (PET) probe 68Ga-Pentixafor for Imaging of breast carcinoma.

METHOD AND MATERIALS

10 patients suffering from breast cancer (9 patients with primary breast cancer, one patient with local recurrent breast cancer) underwent either PET/CT or PET/MR imaging using 68Ga-Pentixafor. The lesions included 9 invasive ductal carcinomas (IDC) and one invasive lobar cancer (ILC). Maximum standardized uptake values (SUVmax) and tumor-to-background ratios (T/B ratio) were determined in the breast cancer lesions and correlated with immunohistochemistry.

RESULTS

8 of 10 breast cancers were visually detectable with a mean SUVmax of 3.1 (range 1.7 to 4.5) and a mean T/B ratio of 2.8. The visually undetectable lesions included the case of ILC and one IDC (T2 Grade 2). Immunohistochemistry revealed highest CXCR4 staining intensity in the patient with local recurrent breast cancer which also showed highest T/B ratio of all examined lesions. Lowest CXCR4 staining intensity was observed in the visually undetectable case of ILC. Interestingly, the CXCR4 positive cells in immunohistochemical workup not only comprised tumor cells but also surrounding lymphocytes.

CONCLUSION

CXCR4 directed PET imaging of breast cancer is feasible. Moreover, based on these first observations in this small patient cohort, histopathological CXCR4 expression profile on the tumor cell surface seems to correlate with signal intensity in PET imaging.

CLINICAL RELEVANCE/APPLICATION

CXCR4 directed PET imaging might be a promising new tool in oncology. Further studies are necessary to evaluate, if signal intensity of the primary cancer in PET is associated with prognostic factors, e.g with metastatic potential of the tumor.

SSQ13-02 Impact of High Definition Reconstruction in FLT PET/CT

Thursday, Dec. 1 10:40AM - 10:50AM Room: S504CD

Participants
Preethi Subramanian, MS, BEng, Columbus, OH (*Presenter*) Nothing to Disclose
Prayna Bhatia, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Katherine Binzel, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Nathan C. Hall, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Bhuvaneswari Ramaswamy, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

18F-fluorothymidine (FLT) is a promising non-invasive PET/CT imaging biomarker taken up in proliferative tissues such cancer lesions, bone marrow and liver that is also used for therapy response assessments which necessitates precise delineation and accurate SUV measurements. We therefore proposed and assessed the benefits of reducing the image reconstruction voxel volume 64mm3 (SD)⇒8mm3 (HD) and thus increasing the effective imaging matrix size.

METHOD AND MATERIALS

Using the list mode raw data from a FLT PET/CT therapy assessment trial, 10 breast cancer patients studies that were imaged

using the list mode raw data from a FLT PET/CT therapy assessment trial, 10 breast cancer patients studies that were imaged using a dose of 10 mCi on a conventional TOF PET/CT system, were reconstructed using a newly implemented high definition (HD) reconstruction approach. The previous FLT datasets were used as comparator and had been reconstructed using a standard definition (SD) default approach using 4 mm voxel length and 33 subsets with 3 iterations. For the HD approach using the 2mm voxel length which leads to 1/8 of the referenced voxel volume, 4 reconstructions with 3 iterations and 33, 21, 15 and 9 subsets were performed on Baseline and follow-up FLT scans. Quantitative assessments were performed by placing 3D ROIs on lesions as well as healthy liver and bone marrow (L1, L3 & L5 vertebrae). Image review was done by three blinded readers.

RESULTS

Initially we compared the different subset approaches for the HD reconstruction and found the 3i9s rated as clinically preferable and was subsequently used. Image quality, lesion detectability and lesion delineation was rated preferable by blinded review and was found to be significantly ($p<.01$) improved on the high definition recon. Our quantitative assessment included 72 lesions across the 24 PET exams, the SUV_Max of lesions increased on average by 18%, while the liver background SUV_Mean varied by only 2-3% between HD and SD recon. Substantial increases in SUV_Mean were also noted in the bone marrow (13%).

CONCLUSION

High definition image reconstruction was found to be feasible and highly beneficial for FLT PET leading to substantially improved image quality and lesion delineation as well as more accurate quantification.

CLINICAL RELEVANCE/APPLICATION

FLT PET imaging benefits from high definition reconstruction leading to improved image quality, lesion delineation and quantitative accuracy.

SSQ13-03 Quantification Accuracy in Detection of Primary Breast Cancer and Axillary Lymph Node Metastasis by Whole-body (WB) and Prone Breast PET/MR Compared with PET/CT

Thursday, Dec. 1 10:50AM - 11:00AM Room: S504CD

Participants
Sirong Chen, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
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William Cheung, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Yim Lung Leung, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Thomas K. Cheng, MBBS, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Ka Nin Wong, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

In this prospective study, we focus on evaluating PET quantification accuracy in primary breast carcinoma (CA) and axillary lymph node (LN) metastasis using WB PET/MR and regional prone PET/MR acquired with breast coil, as compared with PET/CT.

METHOD AND MATERIALS

From April to June 2015, 13 breast CA patients (age=53.4±10.5y) were enrolled for clinically indicated PET/CT and subsequent PET/MR (Biograph mCT & mMR). PET/CT acquired with 2min/bed at ~70min post 18F-FDG injection. WB PET/MR started at ~120min with 5min/bed PET acquisition and axial T2 HASTE, DWI & coronal T2. Regional prone PET/MR with breast coil began at ~160min with 5min PET acquisition and routine breast sequences. PET/CT and PET/MR for primary and axillary LN disease were interpreted individually, with SUVmax and ADC measured.

RESULTS

A total of 20 breast CA lesions (size=2.6±2.0cm) and 11 axillary LN metastases were confirmed by histopathology and follow-up. PET/CT identified 18/20 primary lesions and 9/11 metastatic axillary LN. For primary breast CA, WB PET/MR detected 15/20 lesions and SUVmax was underestimated compared to PET/CT (5.5±5.1 vs 6.9±6.3; median %change=-20%, range=-31~0%). Prone breast PET/MR detected 18/20 lesions with SUVmax comparable to that of PET/CT (6.8±6.2 vs 6.9±6.3; median %change=-3%, range=-10~9%), while inversely correlated with ADC (range=0.59~1.03, mean=0.85±0.12 ×10-3mm2/s, r=-0.627, $p<0.05$). For axillary LN metastasis, WB PET/MR was similar to PET/CT for identifying 9/11 nodes with comparable SUVmax (median %change=9%, range=-11~17%, r=0.889, $p<0.05$). However, prone breast PET/MR detected only 7/11 nodes with significantly different SUVmax (%change=-80~41% compared with PET/CT), which was due to various segmentation misclassification errors of the adjacent non-breast soft tissue as seen on the attenuation coefficient maps, including the axillae.

CONCLUSION

Regional prone PET/MR with breast coil was comparable to PET/CT in quantitative assessment of primary breast CA but was not suitable for evaluation of the axillary nodes, whereas results were opposite for WB PET/MR. Combined prone breast and WB PET/MR is the recommended procedure, particularly if monitoring treatment response is needed for these 2 locations.

CLINICAL RELEVANCE/APPLICATION

Regional prone PET/MR with dedicated breast coil has higher PET quantification and diagnostic accuracy for primary breast tumors than WB PET/MR but should not be used for non-breast tissue assessment.

SSQ13-04 Evaluation of PET and MR Datasets in Integrated 18F-FDG PET/MRI: A Comparison of Different MR Sequences for Whole-Body Restaging of Breast Cancer Patients

Thursday, Dec. 1 11:00AM - 11:10AM Room: S504CD

Participants
Johannes Grueneisen, Essen, Germany (*Presenter*) Nothing to Disclose
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Michael Forsting, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG

PURPOSE

To evaluate the diagnostic value of different MR sequences and PET data, acquired with an integrated PET/MR scanner, for whole-body restaging of breast cancer patients.

METHOD AND MATERIALS

A total of 32 consecutive patients with a suspected recurrence of breast cancer were prospectively enrolled for a whole-body 18F-FDG PET/MR examination. The whole-body MR protocol comprised: 1) T2w HASTE ax., 2) DWI ax. and 3) post-contrast T1w VIBE ax. Two readers evaluated the following datasets 1. MRI alone, 2. PET/MR-HASTE/DWI, 3. PET/MR-HASTE/VIBE, PET/MR-HASTE/DWI/VIBE and were instructed to identify the total number of tumor lesions in each reading session. The diagnostic confidence for each detected lesion (3 point ordinal scale) and the lesion conspicuity (4 point ordinal scale) for the three different MR sequences were additionally rated.

RESULTS

Tumor recurrence was present in 21/32 (66%) patients and a total of 141 lesions (malignant, n = 101; benign, n = 40) were described. On a lesion based analysis, MRI revealed a sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 81%, 85%, 93%, 64% and 82%, respectively and a confidence level (CL) of 2.24 ± 0.71 for the identification of tumor recurrence. All three PET/MR readings were rated higher than MRI alone (PET/MR-HASTE/DWI: 92%, 93%, 97%, 82% and 92%, CL: 2.44 ± 0.66; PET/MR-HASTE/VIBE: 93%, 93%, 97%, 84% and 93%; CL: 2.65 ± 0.53; PET/MR-HASTE/DWI/VIBE: 94%, 95%, 98%, 86% and 94%, CL: 2.72 ± 0.49). Furthermore, mean values for lesion conspicuity were 3.30 ± 0.82 (VIBE), 3.02 ± 0.84 (HASTE) and 2.82 ± 1.15 (DWI), respectively and differed significantly from each other.

CONCLUSION

Our results demonstrate the usefulness of 18F-FDG PET data as a valuable additive to MR imaging for more accurate restaging of breast cancer patients. Furthermore, the presented data underline the benefit of contrast-enhanced MR sequences and questions the use of DWI.

CLINICAL RELEVANCE/APPLICATION

Well-considered MR protocols are required for an accurate and effective oncological work-up of breast cancer patients using integrated PET/MRI. The omission of DWI does not result in a significant impairment of the staging performance but enables a distinctive reduction in scan-duration accompanied by improved patient comfort.

SSQ13-05 Integrative and Comparative Analysis of 18F-FDG PET/CT and DWIFASE, DWIEPI, STIR on 3T and 1.5T MR Imaging: Strategy to Converge More the Trajectory for Diagnosis and Prognostication of Lung Cancer

Thursday, Dec. 1 11:10AM - 11:20AM Room: S504CD

Participants
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Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To quantitatively compare the potential of FDG PET/CT and diffusion-weighted imaging obtained with fast advantage spin-echo sequence (DWIFASE), echo planar imaging sequence (DWIEPI), and short inversion time inversion recovery (STIR) imaging on 3T as well as 1.5T MR imaging in the diagnosis and prognostic prediction of lung cancer.

METHOD AND MATERIALS

3T and 1.5T MRI and PET/CT were prospectively performed in 75 consecutive patients with suspicious lung cancer, followed by surgical treatment. ADCs from DWI and tumor-to-muscle ratio from STIR was calculated in terms of primary lesions as ADCFASE, ADCEPI,3T or ADCEPI,1.5T and STIR3T or STIR1.5T. Spearman correlation coefficient was analyzed between ADCs or STIR values. Multivariate logistic regression analysis was performed to investigate the discriminating factors of malignancy from benign lesions in terms of 1.5T MRI & PET or 3T MRI & PET. Also, all ADC and STIR values and SUVmax as well as clinical characteristics such as staging, histologic subtype, age, sex, and smoking history were investigated with univariate and multivariate Cox regression analysis to evaluate the prognostic potential, where ROC analysis was used to estimate the discriminating performance of prediction model built.

RESULTS

All 83 lung lesions (72 malignant, 11 benign) were analyzed. STIR3T were higher than STIR1.5T (2.401 ± 0.757 and 1.401 ± 0.507, $R = 0.533$, $P < 0.001$). ADCFASE and ADCEPI,1.5T were correlated better than correlations with ADCEPI,3T ($R = 0.876$, 0.821, and 0.659, all $Ps < 0.001$). Multivariate logistic regression analysis helped identify STIR1.5T (OR, 1.006), ADCEPI,1.5T, (0.027) and SUVmax (1.862) in 1.5T as well as ADCFASE (0.752) and SUVmax (1.664) in 3T as significant differentiators of malignancy, with 96.9% sensitivity & 75% specificity, 98.5% & 78.6%). Multivariate analysis revealed sex (HR, 0.042), pathologic subtype (0.007), and STIR3T (17.418) are independent predictors for clinical outcome, with Az of ROC curve of 0.891.

CONCLUSION

We found the potential of DWI and STIR on 3T MRI and 1.5T MRI as well as PET/CT regarding the diagnostic and prognostic prediction of lung cancer, for which the capability was improved when sequences were combined efficiently.

CLINICAL RELEVANCE/APPLICATION

Quantitative image variables from DWI and STIR on 3T and 1.5T MRI can allow more accurate diagnosis and prognostication of lung cancer, thus may contribute to more robust predictive and prognostic biomarkers.

SSQ13-06 Do Staging Differences Between Thoracic 18F-FDG PET/CT and 18F-FDG PET/MR Lead to Different Therapeutic Decisions in Patients Suffering from Non-Small Cell Lung Cancer?

Thursday, Dec. 1 11:20AM - 11:30AM Room: S504CD

Participants
Benedikt M. Schaarschmidt, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
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PURPOSE

To investigate whether differences in thoracic tumor staging between 18F-fluordeoxyglucose positron emission tomography / computed tomography (18F-FDG PET/CT) and 18F-FDG PET / magnetic resonance (18F-FDG PET/MR) imaging change therapeutic decisions in Non-Small Cell Lung Cancer (NSCLC) patients.

METHOD AND MATERIALS

Seventy-seven NSCLC patients (34 female, 43 male, mean age 61 ± 10y) that underwent whole-body 18F-FDG PET/CT from the base of skull to the upper thighs and subsequent thoracic 18F-FDG PET/MR were enrolled in this retrospective study. Thoracic 18F-FDG PET/CT and 18F-FDG PET/MR images were staged by two independent radiologists according to the 7th edition of the AJCC staging manual. Treatment strategies based on staging results of either thoracic 18F-FDG PET/CT or 18F-FDG PET/MR were discussed separately in a simulated interdisciplinary tumor board consisting of an oncologist, a radiation oncologist, a thoracic surgeon and a radiologist under consideration of the histopathological subtype and all available clinical data at the timepoint of imaging. Therapeutic decisions based on both imaging modalities were recorded. Descriptive statistics were used for comparison of the results and reasons for changes in the therapeutic decision were investigated.

RESULTS

Differences in thoracic tumor staging were observed in 35% of patients (27 patients) between thoracic 18F-FDG PET/CT and 18F-FDG PET/MR. Differences between both hybrid imaging modalities were detected when assessing the T-stage in 18% (n = 14), the N-stage in 23% (n = 18), and the M-stage in 1% (n = 1). However, these differences in thoracic tumor staging changed patient therapy management in only six patients (8%).

CONCLUSION

Thoracic 18F-FDG PET/CT and PET/MR lead to comparable therapeutic decisions in patients suffering from NSCLC. 18F-FDG PET/MR can be considered a true alternative to 18F-FDG PET/CT for clinical NSCLC staging.

CLINICAL RELEVANCE/APPLICATION

Comparable therapeutic decisions in PETCT and PET/MR in NSCLC patients allow prospective randomized studies on PET/MR in NSCLC imaging and will speed up its introduction in clinical practice.

SSQ13-07 Clinical Utility of PET/CT's Triggered by ACR LungRads Category 4A or 4B Lung Cancer Screening CT Result

Thursday, Dec. 1 11:30AM - 11:40AM Room: S504CD

Participants
Brandon A. Howard, MD, Durham, NC (*Presenter*) Nothing to Disclose
Matthew P. Thorpe, PhD, MD, Savoy, NC (*Abstract Co-Author*) Nothing to Disclose
Joseph G. Mammarappallil, MD, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

F-18 FDG PET/CT (PCT) is invaluable in pulmonary nodule workup, and uptake correlates with malignancy and, in early stage lung cancers, survival. The National Lung Cancer Screening Trial demonstrated mortality benefit of low-dose screening CT (LDCT) for high risk persons. In ACR LungRads, Category 4 is "suspicious" for malignancy: For 4A, PCT is triggered for an 8-15 mm solid nodule on baseline and for 4B, for a new solid nodule/ solid component of part-solid nodule measuring >= 8 mm. Previous literature rates PCT performance as poor for nodules < 10 mm, however. Given FWHM of PCT scanners is ~8 mm, the lower limit trigger of 8 mm in LungRads will include small nodules which may be underestimated by partial volume effect (3D PET, 3*FWHM = 24 mm). PCT may be insensitive when used in this manner and regular screening may be equivalent. Our study goal is to report the diagnostic utility of PCT performed for workup of Category 4 findings on LDCT.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant study retrospectively reviewed PCT from Feb 2015- March 2016, prompted by positive screening LDCT (Category 4A/4B or read as positive= greater than mediastinum). Standardized uptake value (SUVmax) of nodules was measured. LDCT nodule size and morphology were recorded. Results were correlated with pathology and change in clinical management.

RESULTS

16 patients underwent 16 PCT with 21 nodules yielding mean CT size of 14 (range 8- 30) mm and CT features of solid, part solid, cavitary, spiculated. 6 were PET-positive and of these, 4 malignant on histology; 2 were inflammatory on histology. 15 nodules were PET-negative; 3 of these were classified as benign with no further followup recommended; 12 were scheduled for CT follow up per LungRads. PET-positive rate was 29.5 ± SE 0.10% overall, and PPV as judged by histology or stable behavior on subsequent CT was 0.66 (95% CI 0.29-1.0).

CONCLUSION

38% of nodules on PCT performed for Category 4 LDCT were positive, and 67% of these were malignant. Average nodule size in our population was > 8 mm trigger, but < 24 mm limit for full PET recovery. PET-negative nodules were not sampled, but many of these nodules were stable in size. Further study is needed in a larger patient cohort with longer followup.

CLINICAL RELEVANCE/APPLICATION

Although PCT redemonstrates utility in workup of indeterminate nodules, optimal triggers for PCT in the setting of CT lung cancer screening need further study.

SSQ13-08 Whole-Body FDG-PET/MRI: Comparison of the Capability for the IASLC/ ITMIG Thymic Epithelial Tumor Staging with Whole-Body MRI, Integrated FDG-PET/CT and Conventional Radiological Examination

Thursday, Dec. 1 11:40AM - 11:50AM Room: S504CD

Participants
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
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PURPOSE

To compare the diagnostic capability for the IASLC/ ITMIG thymic epithelial tumor staging among whole-body FDG-PET/MRI, whole-body MRI including diffusion weighted imaging (DWI), integrated FDG-PET/CT with contrast-enhanced (CE-) brain MRI and conventional radiological examination including whole-body CE-CT and CE-brain MRI.

METHOD AND MATERIALS

64 consecutive thymic epithelial tumor patients (30 men, 34 women; mean age 56 years) prospectively underwent whole-body MRI including DWI, integrated PET/CTs, conventional radiological examinations, pathological examinations from specimens obtained CT-guided biopsy and surgical resection and surgical reports as well as follow-up examinations. Then, TNM staging in each patient was determined based on tumor board reviewing all examination results. All co-registered PET/MRIs were generated by means of our proprietary software. Then, TNM staging was evaluated by four different reader groups based on the IASLC/ ITMIG thymic epithelial tumor staging system. To determine inter-observer agreements of each factor assessment on all methods, kappa statistics as well as kai-square tests were performed. To evaluate agreements of all factors between each method and final diagnosis, kappa statistics were also performed. Finally, diagnostic accuracy of each factor and clinical stage was statistically compared each other by using McNemar's test.

RESULTS

Inter-observer agreements of each factor on all methods were determined as substantial or almost perfect (0.67

CONCLUSION

Whole-body PET/MRI and MRI have better potential for the IASLC/ ITMIG thymic epithelial tumor staging than conventional radiological examination, and are considered at least as valuable as PET/CT with CE-brain MRI in this setting.

CLINICAL RELEVANCE/APPLICATION

Whole-body PET/MRI and MRI have better potential for the IASLC/ ITMIG thymic epithelial tumor staging than conventional radiological examination.

SSQ13-09 Sensitivity of PET/MR for Detecting Pulmonary Nodules in Pediatric Cancer Patients

Thursday, Dec. 1 11:50AM - 12:00PM Room: S504CD

Participants
Anne Muehe, MD, Stanford, CA (*Presenter*) Nothing to Disclose
Heike E. Daldrup-Link, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Lillian M. Lai, MD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Andrew Quon, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Valentina Taviani, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Samantha Holdsworth, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the sensitivity of MR, integrated PET+MR and PET+CT for the detection of pulmonary nodules in pediatric cancer patients compared to clinical CT as a standard of reference

METHOD AND MATERIALS

In this prospective IRB-approved, HIPAA-compliant study we performed 15 "one stop" whole body PET/MR scans of 11 pediatric and young adult patients with lymphoma (n=6), bone sarcoma (n=2) and other cancers (n=3). Scans were performed on a GE Signa 3T hybrid PET/MR scanner 60 minutes after 18F-FDG (2-3MBq/kg), using free-breathing axial T2-FSE (TR 5048ms/TE 116ms) and PROPELLER (TR 5669ms/TE 101ms) sequences with simultaneous PET-data acquisition. Two experienced reviewers assessed the number, location and size of pulmonary nodules on CT, MR, PET+MR (i.e. positive on PET and MR) and PET+CT (i.e. positive on PET and CT) scans. Sensitivities of MR, PET+MR and PET+CT were compared with CT as standard of reference.

RESULTS

CT revealed 151 total nodules with 59 ≥ 10mm, 48 between 5-9mm, 34 between 3-4mm and 10 < 3mm in size respectively. MR detected 116 total nodules with 59 ≥ 10mm, 44 between 5-9mm, 12 between 3-4mm and 1 < 3mm in size respectively. Considering clinically significant nodules ≥ 3mm, sensitivity was 81.5% for MR, 56% for PET+MR and 49% for PET+CT. PET+MR and PET+CT detected 59 and 57 nodules > 1 cm, 22 and 14 nodules 5-9 mm, and 4 and 3 nodules 3-4 mm, respectively. The mean effective dose of PET/MR (2.5 mSv) was significantly lower compared to PET/CT (11.4 mSv).

CONCLUSION

MR provided comparable sensitivity compared to CT for the detection of pulmonary nodules ≥ 5 mm, but inferior sensitivity for the detection of 3-4 mm nodules. The PET part of the PET/MRI outperformed the PET part of the PET/CT in the detection of FDG-avid nodules. PET/MR reduced the radiation exposure of the patient by 75% compared to PET/CT.

CLINICAL RELEVANCE/APPLICATION

Solving the limited sensitivity of MRI for the detection of pulmonary nodules will enable "one stop" staging of pediatric cancer patients with substantially reduced radiation exposure compared to PET/CT. Our ongoing studies address further improvement of MRI technologies for detection of clinically relevant pulmonary nodules with a size of 3-4mm.

CHS-THA

Chest Thursday Poster Discussions

Thursday, Dec. 1 12:15PM - 12:45PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

Participants
Archana T. Laroia, MD, Fargo, ND (*Moderator*) Research Consultant, VIDA Diagnostics, Inc;

Sub-Events

CH283-SD-THA1 Detection of Ground-glass Opacity Lesions using Breath-hold Black-blood Magnetic Resonance Imaging of the Lungs

Station #1

Participants
Ryotaro Kamei, MD, Fukuoka, Japan (*Presenter*) Nothing to Disclose
Yuji Watanabe, MD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Koji Sagiyama, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Satoshi Kawanami, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroshi Honda, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility and usefulness of breath-hold black-blood T2-weighted (BBT2W) turbo spin echo magnetic resonance imaging (TSE MRI) of the lungs in the detection of focal ground-glass opacity (GGO) lesions.

METHOD AND MATERIALS

We included 44 consecutive patients who underwent high-resolution computed tomography (HRCT) and MRI of the whole lungs between August 2014 and March 2016. MRI scans were acquired using a 3.0-T MR of Ingenuity TF PET/MR instrument (Philips Healthcare). BBT2W imaging was performed using the variable refocusing flip-angle technique under breath-hold with peripheral pulse unit (PPU) gating. Breath-hold T1-weighted imaging (T1WI) with a 3D modified Dixon sequence was also performed to obtain information on the vascular anatomy.Diagnostic HRCT images were used as the reference standards. The location, number, size, and characterization (pure or mixed) of the GGO lesions were recorded. Two radiologists blinded to the HRCT findings performed consensus interpretation of the MR images. For the focal GGOs, lesion-based detection rates were calculated and compared between BBT2WI and T1WI scans. Statistical analyses were performed using the McNemar test. Correlation analysis and the Bland-Altman plot was used for lesion size comparison between the HRCT and MRI scans.

RESULTS

HRCT revealed 24 GGO lesions in 12 patients. Upon interpretation of the MRI scans, lesion-based detection rates of focal GGOs were 79.2% (19/24) for BBT2WI and 54.2% (13/24) for T1WI. T1WI detected only 1 of 10 pure GGOs and 12 of 14 mixed GGOs, while BBT2WI detected 5 of 10 pure GGOs and all the mixed GGOs. The GGO size on BBT2WI had a strong correlation with that of HRCT ($r = 0.9425$, $p < 0.0001$), and the mean difference was small (0.7095 mm). Although there was a significant correlation between the sizes detected on T1WI and HRCT ($r = 0.6868$, $p = 0.0118$), the GGOs tended to appear smaller on T1WI than on HRCT, with a mean difference of 6.694 mm.

CONCLUSION

Breath-hold black-blood T2-weighted MRI of the lungs with PPU gating is feasible and could provide acceptable diagnostic quality for detecting GGO lesions.

CLINICAL RELEVANCE/APPLICATION

Breath-hold black-blood lung MRI using PPU gating is feasible with acceptable diagnostic accuracy and could be useful for the long-term follow-up of GGOs without any irradiation.

CH278-SD-THA2 Lymphoid Interstitial Pneumonias (LIP) based on Recent Diagnostic Criteria; CT-Pathologic Correlation in 10 Patients

Station #2

Participants
Takeshi Johkoh, MD, PhD, Itami, Japan (*Presenter*) Research Consultant, Bayer AG Research Consultant, F. Hoffman-La Roche Ltd
Tomonori Tanaka, MD, Toyama, Japan (*Abstract Co-Author*) Nothing to Disclose
Kiminori Fujimoto, MD, PhD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuya Ichikado, MD, PhD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Junya Fukuoka, Nagasaki City, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Tomiyama, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Although LIP was originally rare diseases, it has been a much more rare entity after revision of diagnostic criteria with ATS-ERS 02 and 13 consensus classification of idiopathic interstitial pneumonias (IIPs). The objective of the present study was to precisely correlate CT findings of LIP based on recent diagnostic criteria with the pathologic ones

METHOD AND MATERIALS

Based on the definition of both ATS/ERS02 and 13 consensus classifications of IIPs, 10 cases diagnosed as LIP (4 female, 6 male,

mean age; 52 years old) with surgical lung biopsy were enrolled in the study、1 to 3 specimens in each case were obtained and total 23 specimens were collected. CT findings corresponding to the 23 specimens were precisely correlated with pathologic ones

RESULTS

CT showed lower lobe predominance, ground-glass opacities (GGO), and cyst in all cases, thickening of interlobular septa in 5, cenrtilobular nodules and pleural thickening in 4, respectively, and thickening of bronchovascuar bundels in 2.. Regarding corresponding areas to 23 surgical biopsy sites、CT demonstrated GGO in all 23 cases, centrilobular nodules and thickening of interlobular septa in 3, respectively, and pleural thickening and cysts in2, respectively,Pathologically, GGO correlated with the infiltration of lymphoid cells to alveolar septa and centrilobular nodules corresponded to either the infiltration of lymphoid cells to alveolar septa along bronchioles and lymphoid follicles in bronchial walls(Fig 1). Thickening of interlobular septa and pleura on CT corresponded to the lymphoid infiltration and lymphoid follicles in interlobular septa and pleural. Cysts pathologically correlated with destruction and elastolysis of alveolar septa surrounding aggregated lymphoid cells (Fig 2)

CONCLUSION

The common CT finding of LIP is ground-glass opacity due to pathologically the infiltration of lymphoid cells to alveolar septa. Cyst formation is related to elastolysis of alveolar septa.

CLINICAL RELEVANCE/APPLICATION

The common CT finding of LIP is ground-glass opacity and cysts. Ground-glass opacity pathologically corresponds to the infiltration of lymphoid cells to alveolar septa. Cyst formation is related to elastolysis of alveolar septa.

CH279-SD-THA3 Classification of Stage 1 Lung Adenocarcinoma Outcomes on CT: Volumetric and Texture Analysis

Station #3

Awards
Student Travel Stipend Award

Participants
Antonio Pires, MD, NEW YORK, NY (*Presenter*) Nothing to Disclose
Bowen Niu, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Henry Rusinek, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Harvey I. Pass, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jane P. Ko, MD, New York, NY (*Abstract Co-Author*) Speaker, Siemens AG

PURPOSE

To determine the ability of semiautomated CT segmentation with texture and volumetric analysis to differentiate stage 1 lung adenocarcinomas (AdCas) with differing clinical outcomes.

METHOD AND MATERIALS

IASLC classified Stage 1 surgically-resected AdCas in 45 patients with at least 3-yr follow up and preoperative noncontrast CTs (1 x 0.8 mm) were studied. IRB exemption was obtained. Average follow up was 3.8 +/- 1.8 yr including 5 of 45 lung-cancer related deaths at mean 2.5 +/- 1.8 yr. In 17 of 45 cases, disease progression, defined as local spread or distant metastasis, occurred at mean 2.6 +/- 1.4 yr). In 3 patients with multiple nodules, the largest nodule was analyzed.3D nodule masks were created using a previously-validated (including phantom validation) segmentation algorithm that estimates nodule volume, mass, and fraction of solid component. The largest nodule slice underwent 2nd order texture analysis of run length and signal co-occurrence. To minimize overfitting, texture features were averaged over directional vectors. Two model types were constructed: 1) linear discriminant analysis (LDA) 2) logistic regression. Models were fitted to combination of 2nd order texture features and 3D segmentation metrics.

RESULTS

Using LDA classifier, 98% (44/45) of survival outcomes were classified correctly with only 1 case misclassified. Disease progression was correctly classified in 91% (41/45), sensitivity = 88% (15/17).Binomial logistic regression predicted survival in 100% (45/45). It was less accurate for disease progression with accuracy = 80% (36/45) and sensitivity = 71%.Up to 24 unique texture features contributed to classification, including entropy, contrast, and inverse difference moment (homogeneity). For example, entropy is a good measure of inherent structure in an image. Average entropy was 0.95 +/- 0.49 in cases of death and 0.64 +/- 0.30 in cases of survival, indicating decreased CT structural features in lung AdCas with worse prognosis .

CONCLUSION

Texture and volumetric analysis can potentially differentiate Stage I lung adenocarcinomas with varying clinical outcomes and may improve prognostic stratification of patients.

CLINICAL RELEVANCE/APPLICATION

Outcomes in stage 1 lung adenocarcinoma are difficult to predict based on visual assessment of morphologic features at CT. Texture and volumetric analysis can serve as indicators for clinical behavior and can potentially aid in patient management.

CH280-SD-THA4 Lung Cancer Screening in a Socioeconomically Disadvantaged Population

Station #4

Awards
Student Travel Stipend Award

Participants
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Leah M. Lin, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Farhood Saremi, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Bonnie Garon, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Ana Maliglig, MD, MPH, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Alison Wilcox, MD, Los Angeles, CA (*Abstract Co-Author*) Speaker, Toshiba Corporation
Christopher Lee, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To describe preliminary results of our clinical low-dose CT (LDCT) lung cancer screening program targeting a socioeconomically disadvantaged and high-risk population different from that studied in the National Lung Screening Trial (NLST).

METHOD AND MATERIALS

All patients met USPSTF and/or NCCN eligibility criteria for lung cancer screening. A dedicated screening coordinator enrolled eligible patients, scheduled their screening exams, and organized their transportation to and from the medical center. A 2-year grant from a 501(c)(3) tax-exempt public charity covered all expenses, including the creation of an online database.

RESULTS

505 patients were referred to the program from 7/21/2015 through 3/20/2016. 31 patients declined screening, and 68 were unable to be contacted. Of 209 patients who agreed to participate, 154 met eligibility criteria for lung cancer screening. 112 patients underwent their baseline LDCT during this time period.72 males (64%) and 40 females (36%) received baseline LDCT, with a mean age of 59 years (range 50-76) and median BMI of 27.0. The median pack-years was 40 (range 20-191), and 85% (95) of patients were current smokers. The ethnic makeup of the population was 84% (95) black, 7% (8) white, 7% (8) Hispanic/Latino, and 1% (1) Asian. 66% (74) of patients had no more than a high school education. 38% (43) of patients reported occupational exposure to one or more lung carcinogens.84% (95) of patients received a Lung-RADS score of 1 (32) or 2 (63), 8% (9) received a score of 3, 4% (4) a score of 4A, and 4% a score of 4B (3) or 4X (1). 2 patients (1.8%) have been diagnosed with lung cancer to date. 35% (40) of patients had potentially significant incidental findings including interstitial lung disease (7), severe emphysema (7), aortic aneurysm (1), moderate-severe coronary calcifications (13), extrapulmonary masses (12), severe hepatic steatosis (1), and advanced metastatic disease of extrathoracic origin (1).

CONCLUSION

Lung cancer screening with LDCT in a socioeconomically disadvantaged population is feasible yet may yield different rates of cancer diagnosis than screening in more affluent communities. More follow-up time is required to determine whether the reduction in lung cancer mortality demonstrated in the NLST applies to this population.

CLINICAL RELEVANCE/APPLICATION

Socioeconomically disadvantaged and high-risk communities may experience differential benefits from LDCT lung cancer screening.

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/

Farhood Saremi, MD - 2015 Honored Educator

CH281-SD-THA5 Utilization Trends of Noncardiac Thoracic Imaging among Radiologists and Other Physicians

Station #5

Participants
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Laurence Parker, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Vijay M. Rao, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze recent trends in the utilization of the various noncardiac thoracic imaging modalities in the Medicare population.

METHOD AND MATERIALS

The Medicare part B databases for 2002 through 2014 were reviewed. All CPT codes pertaining to noninvasive imaging of the thorax were selected and grouped into seven categories: x-ray, CT, CTA, nuclear scans (noncardiac), MR, MRA and ultrasound. Yearly utilization rates per 1,000 Medicare beneficiaries were calculated. Medicare physician specialty codes were used to determine how many studies were performed by radiologists versus self-referring nonradiologist physicians. Trends over the 12 year period were studied.

RESULTS

The total utilization rate of all chest imaging peaked at 1090 per 1000 in 2005, then progressively declined to 913 by 2014 (-16%). Among studies performed by radiologists, total thoracic imaging peaked at 969 per 1000 in 2005, then declined to 828 (-14%) by 2014. The chest CT rate rose sharply, peaked at 94 in 2007, then declined to 88 (-6%) by 2014. The CTA utilization rate has risen significantly since 2002, increasing 38% in the last four years alone to a rate of 23 studies per 1,000 in 2014. Utilization rates of nuclear chest imaging, such as VQ scans have decreased steadily by 36% since 2002. Chest x-ray rates reached a peak of 969 in 2005 but then declined by 15% to 828 in 2014. MR, MRA and Ultrasound of the chest were infrequently performed with a rate of 1 to 2 studies per 1,000 without significant changes in rate over time. Total utilization rate of chest imaging among nonradiologists peaked in 2003 with a rate of 92 studies per 1,000 Medicare beneficiaries; this has since declined 48% to 48 per 1000 in 2014. Nonradiologists' use of chest imaging is confined almost entirely to plain x-ray.

CONCLUSION

Noncardiac thoracic imaging is strongly dominated by radiologists. Trends show increasing utilization of CT and CTA with a decline in x-ray and nuclear imaging. Overall, there has been a substantial decline in utilization rates of chest imaging in recent years; this is due in part to the relatively low level of self-referral.

CLINICAL RELEVANCE/APPLICATION

N/A

CH282-SD-THA6 CT Patterns and Serial CT Changes in Lung Cancer Patients Post Stereotactic Body Radiotherapy (SBRT)

Station #6

Participants
Usman Tarique, BSc, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Laura Jimenez-Juan, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Patrick C. Cheung, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Rahim Moineddin, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Anastasia Oikonomou, MD, PhD, Toronto, ON (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the different CT patterns of post SBRT changes in lung cancer patients and to identify specific time points of serial CT changes.

METHOD AND MATERIALS

184 lung cancers in 170 patients (87 female, median age 74 yrs) were evaluated on sequential chest CTs within a period of 29 months (3-72). The frequencies of pre and post-treatment CT patterns were evaluated. Time points of initiation of each pattern from end of treatment and duration were assessed. Time points until size of primary lesion or surrounding CT pattern continued to increase without evidence of local recurrence were assessed. Time points until stabilization, local recurrence, development of metastasis or rib fractures were evaluated.

RESULTS

The most frequent pre-treatment patterns were solid nodule (62%) and solid mass (15%). Post-treatment CT patterns could overlap in the same patient and were nodule-like (68%), consolidation with GGO (48%), modified conventional (46%), peribronchial/patchy consolidation (43%), patchy GGO (27%), diffuse consolidation (27%), "orbit-sign" (14%), mass-like (10%), scar-like (5%) and diffuse GGO (4%). Patchy GGO began in 4 months (range:1-14) and lasted up to 16 months. Peribronchial/patchy consolidation (2-35) and consolidation with GGO (1-29) began in 5 months and lasted up to 26 and 41 months respectively. Diffuse GGO began in 7 (3-19) and lasted up to 4 months. Diffuse consolidation (3-38) and orbit sign (3-34) began in 8 months and lasted up to 5 and 18 months respectively. Modified conventional pattern began in 13 months (1-49). Primary lesion (18/184) or surrounding CT pattern (92/184) continued to increase in size 9 (3-32) or 14 months (2-59) respectively after the end of treatment. Primary lesion (120/184) or surrounding CT pattern (123/184) started to decrease in size 4 (1-30) or 10 months (4-70) respectively after the end of treatment. Time to stabilization in 77 lesions was 23 months (6-59). Local recurrence, metastasis or rib fractures occurred in 17 (7-38), 17 (3-66) or 18 months (7-68) respectively after the end of treatment.

CONCLUSION

There is a specific timing in sequence of appearance and variable periods of duration of the different CT patterns post-SBRT treatment.

CLINICAL RELEVANCE/APPLICATION

Understanding the different post-SBRT CT patterns expected, the time points of appearance as well as the range of duration is crucial in differentiating local recurrence from radiation changes.

CH208-ED-THA7 Thoracic Metastases: A Practical Approach to Typical and Atypical Radiological Patterns

Station #7

Participants
Tassia R. Yamanari, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
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Thais C. Lima, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Claudia D. Leite, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Research Grant, General Electric Company
Chang k. Chi, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Guilherme H. Bachion, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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TEACHING POINTS

Thoracic structures commonly are involved in patients with metastatic neoplasms. Knowledge of the variety of imaging patterns of thoracic metastases and understanding of the mechanisms of spread of metastatic tumors is essential for correct diagnosis. Our exhibit will emphasize the recognition of the primary malignancy based on the specific patterns of thoracic metastases.

TABLE OF CONTENTS/OUTLINE

1. Overview of the mechanisms of spread of metastatic tumors: direct extension, hematogeneous spread, lymphatic spread, within the pleural space and endobronchial spread.
2. Illustrate the imaging spectrum of typical and atypical patterns of thoracic metastasis, including: airways (endobronchial

metastases), lung (multiple nodules, cavitations, calcifications, solitary nodule, halo sign, consolidation / ground-glass opacity), interstitial and lymphatic (carcinomatous lymphangitis), mediastinal lymph nodes involvement, vascular (tumor emboli), pleura and chest wall.
3. Recognize the most common primary malignancies that correlate with each imaging pattern of thoracic metastases.

CH171-ED-THA8 **Added (Lab) Value: Serum Markers and Lung Disease**

Station #8

Awards
Cum Laude

Participants
Demetrios A. Raptis, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Travis S. Henry, MD, San Francisco, CA (*Abstract Co-Author*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd
Sanjeev Bhalla, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Andrew B. Wallace, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

TEACHING POINTS

With the increased role of cross-sectional imaging in diagnosing pulmonary and cardiothoracic disease processes, an understanding of serologic markers and their corresponding imaging characteristics can help narrow the differential and make an accurate diagnosis. This exhibit aims to: 1. Provide a case based, pictorial review of the key imaging features of cardiothoracic disease processes and their corresponding serologic markers. 2. Develop an understanding of the imaging features, corresponding serologic markers, and clinical presentation of the following entities to help make an accurate diagnosis.

TABLE OF CONTENTS/OUTLINE

A. Autoimmune disease markers a. Connective tissue diseases b. Other autoimmune diseasesB. Acute phase proteinsC. Elevated white blood cell count a. Pneumonia b. Other cardiothoracic infectious processesD. Red blood cell aplasia a. ThymomaE. Eosinophilic lung disease a. Simple pulmonary eosinophilia b. Chronic eosinophilic pneumonia (increased IgE, ESR) c. Churg-Strauss F. Other markers of infection, including fungal a. Aspergillus b. Mucormycosis G. IgG4 a. IgG4 related lung disease b. IgG4 related thoracic lymphadenopathy

Honored Educators

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Travis S. Henry, MD - 2016 Honored Educator
Sanjeev Bhalla, MD - 2014 Honored Educator
Sanjeev Bhalla, MD - 2016 Honored Educator

CHS-THB

Chest Thursday Poster Discussions

Thursday, Dec. 1 12:45PM - 1:15PM Room: CH Community, Learning Center

CH

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants

Archana T. Laroia, MD, Fargo, ND (*Moderator*) Research Consultant, VIDA Diagnostics, Inc;

Sub-Events

CH277-SD-THB1 Dual-Energy Chest Radiograph: Can Bone-selective Images Increase Radiologists' Detection of Bone Metastasis?"

Station #1

Participants
Marcelo K. Benveniste, MD, Houston, TX (*Presenter*) Nothing to Disclose
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Jia Sun, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jeremy J. Erasmus, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Myrna C. Godoy, MD, PhD, Houston, TX (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

Evaluate if the use of dual-energy (DE) subtraction images increases radiologist’s detection of bone metastasis on chest radiographs.

METHOD AND MATERIALS

100 consecutive chest radiographs performed in patients with metastatic bone lesions identified on same-day chest CT were retrospectively selected, including 50 patients with lytic and 50 patients with sclerotic bone metastases. 100 consecutive chest radiographs without metastatic bone lesions confirmed on same-day chest CT were included as control group.The selected 200 cases were presented to 3 board-certified chest radiologists in two manners: 1) posteroanterior (PA) and lateral images only (conventional X-ray) and 2) PA, lateral, PA with bone subtraction and PA bone selective images (DE X-ray), resulting in a total of 400 randomized de-identified chest radiograph datasets for review. Readers were blinded for any clinical or prior imaging information, including the same-day CT scan. They recorded the presence, type (sclerotic and lytic) and location (spine, rib, clavicle, scapula, sternum and humerus) of metastatic involvement. Accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to evaluate the yield of conventional X-ray versus DE X-ray for diagnosis of metastatic bone lesions. Comparison was performed using McNemar’s test. All tests were two-sided and p-values of 0.05 or less were considered statistically significant. The study was approved by institutional review board.

RESULTS

Readers had significantly higher sensitivity, NPV and accuracy (52%, 68% and 76%, respectively) for detection of bone metastases using DE X-ray versus conventional X-ray (respectively, 26%, 59% and 63%; McNemar's Test P-value < 0.0001). The sensitivity for detection of both lytic and sclerotic bone metastasis was higher with DE X-ray (46% and 58%, respectively) versus conventional imaging (19% and 40%, respectively). The specificity and PPV was 100% for both methods.

CONCLUSION

The addition of dual-energy selective bone images to conventional chest radiograph improves the diagnostic yield for detection of sclerotic and lytic bone metastases.

CLINICAL RELEVANCE/APPLICATION

Dual-energy chest radiograph subtraction technique is a noninvasive, reliable, and reproducible imaging tool that helps in the assessment of bone metastasis.

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/

Sonia L. Betancourt Cuellar, MD - 2014 Honored Educator
Jeremy J. Erasmus, MD - 2015 Honored Educator

CH284-SD-THB2 Breath-Hold Black-Blood T2-weighted Lung Magnetic Resonance Imaging: Optimization of Blood-Flow Signal Suppression using Peripheral Pulse Unit Gating

Station #2

Participants
Ryotaro Kamei, MD, Fukuoka, Japan (*Presenter*) Nothing to Disclose
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Koji Sagiyama, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
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Hiroshi Honda, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of breath-hold black-blood T2-weighted imaging (BB-T2WI) of the lungs using peripheral pulse unit (PPU) gating for obtaining high quality black-blood images of the lungs.

METHOD AND MATERIALS

Eight male volunteers (28–58 years old) underwent magnetic resonance imaging (MRI) of the lungs with the 3.0-Tesla MR part of an Ingenuity TF PET/MR instrument (Phlips Healthcare). Breath-hold BB-T2WI was performed using the variable refocusing flip-angle (VRFA) technique in combination with PPU gating, during which the electrocardiogram and blood flow rates of the pulmonary artery and vein were monitored. For PPU gating, the trigger delay times were set as follows: (1) random (without gating), (2) shortest (166 ms), (3) longest (374–616 ms, depending on the participants' heart rate), and (4) intermediate (the average of (2) and (3)). T2WI scans without BB were also obtained, and used as references.The uniformity and degree of vascular suppression were assessed visually using a 5-point scale. The vascular signal suppression rate was assessed objectively by extracting the vessel area and measuring the areas with signal intensities >5 fold the standard deviation of the signal intensities of the interlobar fissure. Vascular signal suppression rates were compared between the 4 groups, with reference to non-BB prepared images. All statistical analyses were performed using repeated measures ANOVA and the Friedman test.

RESULTS

In all the volunteers, the longest trigger delay constantly corresponded to the mid-systolic phase, whereas the shortest and the intermediate delays corresponded to the diastolic phase. The inter-slice uniformity and degree of vascular suppression were significantly higher in the longest trigger delay group than in the shortest and the intermediate trigger delay groups ($p < 0.05$). The longest trigger delay group showed a markedly better vascular signal suppression rate (76%/77%) compared to the random (59%/58%), shortest (46%/45%), and intermediate (48%/50%) trigger delay groups (right/left lung, $p < 0.05$).

CONCLUSION

Black-blood lung MRI with PPU gating is feasible, and the longest trigger delay corresponding to the mid-systolic phase could provide high quality black-blood images of the lungs.

CLINICAL RELEVANCE/APPLICATION

Breath-hold black-blood lung MRI with PPU gating is feasible and could provide high quality black-blood images that could increase the detection of lung nodular lesions.

CH285-SD-THB3 Evaluation of Tumor Invasiveness of Thymic Epithelial Tumors using Magnetic Resonance Imaging: Correlation with the World Health Organization Histologic Classification System Updated in 2015 and Masaoka-Koga Staging System

Station #3

Participants
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Tomohiro Ebata, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Shuji Nagata, MD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshi Abe, MD, Kurume, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess magnetic resonance (MR) imaging features with histological assessment and invasiveness of thymic epithelial tumors (TETs) based on the World Health Organization (WHO) histological classification updated in 2015 and to determine the useful finding in differentiating invasive tumors from non-invasive tumors.

METHOD AND MATERIALS

A total of 126 patients with a TET (94 thymomas and 32 thymic carcinomas) underwent MR imaging before surgery were retrospectively reviewed. There were 57 non-invasive tumors and 69 invasive tumors. Histological subtype of the TET was determined according to the WHO classification. MR imaging features were classified into 10 findings and 3 dynamic contrast-enhanced patterns and were assessed independently by two radiologists without knowledge of any clinical or histologic findings. These MR features were correlated with the histological subtypes and the useful findings for predicting the tumor invasiveness were assessed.

RESULTS

There was statistically significant relationship between WHO histological classification and tumor invasiveness ($P < .001$). All tumors were re-classified into three subtypes: 55 low-risk thymomas (types A, AB, and B1), 39 high-risk thymomas (types B2 and B3), and 32 thymic carcinomas.On MR imaging, thymic carcinomas were more likely to have irregular contour than other subtypes ($P < .01$). Low-risk thymomas were more likely to have low-intensity rim than other subtypes ($P < .01$). Signal intensity and Gd-DTPA enhancement of thymic carcinomas were more heterogenous than other subtypes ($P < .005$).With dynamic contrast-enhanced pattern, type B3 thymomas and thymic carcinomas were more likely to have a gradually signal increase pattern; other subtypes showed a rapidly increase with early peak pattern ($P < .05$). On diffusion-weighted imaging, the apparent diffusion coefficient (ADC) values of type B3 and carcinomas were statistically significant lower than those of other subtypes ($P < .05$).

CONCLUSION

MR imaging characteristics of TETs correlate with the subtypes according to 2015 histological WHO classification; it was shown to reflect the tumor invasiveness; and it may be helpful in the prediction of prognosis.

CLINICAL RELEVANCE/APPLICATION

Characteristic MR features of high-risk thymic tumors were irregular contour, invisible capsule, heterogenous signal intensities, heterogeous contrast-enhancement pattern, and lower ADC values.

CH286-SD-THB4 Automatic Lung-RADS Classification of CT Lung Screening Reports with a Natural Language Understanding System

Station #4

Participants
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Brady J. McKee, MD, Burlington, MA (*Abstract Co-Author*) Spouse, Advisory Board, Medtronic plc
Gilan El Saadawi, Pittsburgh, PA (*Abstract Co-Author*) Director, MModal IP LLC
Andrea B. McKee, MD, Burlington, MA (*Abstract Co-Author*) Advisory Board, Medtronic plc; Speaker, Medtronic plc; ;
Shawn M. Regis, PhD, Burlington, MA (*Abstract Co-Author*) Consultant, Medtronic plc
Sebastian Flacke, MD, Burlington, MA (*Abstract Co-Author*) Consultant, BTG International Ltd Consultant, Surefire Medical, Inc Consultant, Koninklijke Philips BV Consultant, XACT Robotics
Christoph Wald, MD, PhD, Burlington, MA (*Abstract Co-Author*) Radiology Advisory Committee, Koninklijke Philips NV

PURPOSE

The aim was to train a natural language understanding (NLU) algorithm to capture all imaging characteristics of lung nodules reported in a structured CT report and suggest the applicable Lung-RADS (LR) category.

METHOD AND MATERIALS

Our study included structured, clinical reports of clinical CT lung screening exams performed from August 2014 to August 2015 at an ACR certified Lung Screening Center. All patients screened were at high-risk for lung cancer according to the NCCN Guidelines. All exams were interpreted by 1 of 3 radiologists credentialed to read CT lung screening exams using ACR Lung-RADS. Training and test sets consisted of consecutive exams.A UIMA platform supporting a pipeline of iterative NLP tasks was used to map the information in the exam findings to the appropriate LR category or indicate that the identified descriptive image data was insufficient to determine the LR category. SNOWMED clinical findings concepts, extended by RadLex where appropriate, constituted the lexicon. Lung screening exams were divided into two groups: Three training sets (500, 120, and 383 reports each) and one final evaluation set (498 reports). NLU algorithm results were compared with the gold standard of LR category assigned by the radiologist.

RESULTS

The sensitivity and specificity of the NLU algorithm for correctly assigning LR categories for suspicious nodules (LR 3 or 4) were both 95.5 %. Misclassifications resulted from the failure to identify exams as follow-up and the failure to completely characterize part-solid nodules. The sensitivity and specificity to identify LR 2 among LR 1 and 2 nodules were 98.7 % and 99.7 %, respectively. The sensitivity and specificity to identify LR 4 among LR 3 and 4 nodules were 89.5 % and 94.4 %, respectively. Mismatches could also be noted if features such as inflammation or enlarged lymph nodes were present for which currently no LR guidelines exist.

CONCLUSION

An NLU system to suggest the appropriate ACR LungRADS category is very sensitive and specific if underlying standardized reporting is used. As lung screening becomes more widely adopted, such a system may provide useful "look-over-the-shoulder" type assistance to novice interpreters of lung screening exams.

CLINICAL RELEVANCE/APPLICATION

As lung screening becomes more widely adopted, automated assistance with assigning ACR LungRADS category may prove useful to assist novice interpreters and as a quality assurance and standardization tool.

CH287-SD-THB5 Iterative Metal Artifact Reduction in Postsurgical Thoracic CT: Evaluation of Three Different Metal Artefact Reduction Algorithms

Station #5

Participants
Joel Aissa, Duesseldorf, Germany (*Presenter*) Nothing to Disclose
Johannes Boos, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Patric Kroepil, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Rotem S. Lanzman, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christoph K. Thomas, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study was to evaluate the impact of three novel iterativemetal artifact reduction (MAR) algorithms on image quality and artifact strength in chest CT of patients with thoracic metallic implants.

METHOD AND MATERIALS

We evaluated 27 postsurgical patients who had undergone CT between March and May 2015 in clinical routine. Thoracic implants (n=38) included sternal steel wiring (n=25), left ventricular assist devices (n=3), port systems (n=3), pacemakers (n=3) and overlying devices (n=4). Images were retrospectively reconstructed on a workstation with standard weighted filtered back projection (WFBP) and additionally with three iterative MAR algorithms [iMAR 2D: "Cardiac"–algorithm (algo1), "Pacemaker"-algorithm (algo2) and "ThoracicCoils"-algorithm (algo3)]. Subjective image quality was assessed for each implant using a 5 point scale (1: severe artifacts, non-diagnostic - 5: excellent image quality, no artifacts). The objective artifact strength was determined by ROI measurements of image noise insertion next located to the implants.

RESULTS

All reconstructions showed diagnostic image quality. Mean overall scores for the iMAR algorithms were 3.8±0.1 for algo1, 4.3±0.8 for algo2 and 4.2±0.7 for algo3. All iMAR algorithms showed a significantly better overall image quality compared to WFBP

reconstructions (p<0.01). Concerning mild artifacts, these were strongest for WFBP (near field: 3.6±0.5, far field 4.5±0.6) and iMAR algo1 (near field: 3.8±0.5, far field 4.7±0.5). We found significantly lower moderate to low artifacts for the algo2 and algo3 reconstructions (near field: 4.5±0.5, far field 4.9±0.2 and near field: 4.5±0.5, far field 4.9±0.3, p<0.01). Concerning strong artifacts we found no significant difference between the iMAR algorithms. Artifact strength was significantly lower for the algo1 (58.9±36.1), algo2 (52.7±43.9 HU) and algo3 (51.9±44.1 HU), compared with standard technique (p<0.01).

CONCLUSION

Our results showed a significant reduction of metal artifacts and a significant increase in overall image quality for three different iMAR algorithms compared to WFBP in chest CT of patients with metallic implants. The "Pacemaker" and "ThoracicCoils" algorithm were best for mild artifacts while the "Cardiac" algorithm was superior for severe artifacts.

CLINICAL RELEVANCE/APPLICATION

Our results indicate that a selection of iMAR algorithms adjusted to patients' metal implants and artifact severity can help to improve image quality in chest CT.

CH288-SD-THB6 Role of Delayed Enhanced Phase in the Intra-Thoracic Staging of Lung Cancer

Station #6

Participants
Paola Franchi, Rome, Italy (*Presenter*) Nothing to Disclose
Anna Rita Larici, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Annemilia del Ciello, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Cicchetti, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Davide Coviello, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Lorenzo Bonomo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the role of a delayed enhanced phase (DEP) in the intra-thoracic staging of lung cancer on Computed Tomography (CT)To evaluate the additional information provided by DEP when compared to the arterial phase (AP) alone

METHOD AND MATERIALS

150 CT exams of patients with lung cancer at first staging were retrospectively reviewed by two chest radiologists in consesus. All patients were studied after contrast material (CM) injection (concentration: 300–370mgI/mL; flow rate: 3 to 4mL/s) with a standard AP (35-40 seconds after contrast material injection), and with a DEP (50-60 seconds after contrast material injection). Image assessment was performed by the two radiologists in two different reading sessions: AP (session A) and AP+DEP (session B).Parameters analysed in both sessions were: tumor dimensions, invasion of local anatomical structures, venous involvement, and lymph node involvement. The radiologists reported a CT TNM stage in both sessions. During reading sessions, the readers assigned a confidence level for each parameter evaluated.Subsequently, it was studied the occurrence of evaluation change and a statistical analysis with chi-square ($\chi 2$) test on the confidence level was performed.

RESULTS

Between the two reading sessions, evaluation differences were observed in all parameters examined.DEP added information also on dimensions of primary tumor, especially for central ones enabling distinction between pathological tissue and parenchymal atelectasis.The readers changed their CT TNM stage in 10% of T evaluation and in 35% of N evaluation.Confidence level significantly increased in the assessment of each parameter and in the overall evaluation (p<0.05).

CONCLUSION

-In lung cancer CT staging, a DEP of the chest after the AP could change patient's clinical stage. -DEP dramatically increases the radiologists' confidence level on the evaluation of intra-thoracic extension of lung cancer.

CLINICAL RELEVANCE/APPLICATION

-DEP could change lung cancer TNM staging, thus further diagnostic and treatment plans.-The higher confidence level could be particularly useful for "non-thoracic" radiologists.

CH173-ED-THB7 Four-dimensional Chest CT with Free Breathing: The use of Dynamic-ventilatory Scanning for Various Thoracic Diseases

Station #7

Participants
Tsuneo Yamashiro, MD, Nishihara, Japan (*Presenter*) Research Grant, Toshiba Corporation
Hiroshi Moriya, MD, Fukushima-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukihiro Nagatani, MD, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Osamu Honda, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsuko Fujikawa, MD, PhD, Kawasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Sadayuki Murayama, MD, PhD, Nishihara-Cho, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation

TEACHING POINTS

Dynamic-ventilatory scanning is a novel fluoroscopic method of chest CT, which can be acquired by 320- or 256-row scanners (Aquilion ONE by Toshiba and Revolution CT by GE) and can visualize respiratory movement of the thorax with a wide length (160 mm). Compared with conventional CT, the various respiratory motions of thoracic structures can be solely visualized using dynamic-ventilation CT, which is useful to understand pathophysiology in the airways and lung. In this exhibit, we aim (1) to introduce some recommended methods for scanning and reconstruction, (2) to summarize the current achievements for various chest diseases, and (3) to introduce our perspective for the future use of dynamic-ventilation CT.

TABLE OF CONTENTS/OUTLINE

1. Methodology Scanning: time length, radiation exposure, control of breathingPost-processing: time resolution, data volume,

2. Methodology Scanning: time longer, radiation exposure, control of breathing; use processing: time resolution, data volume, additional interpolation***2. Interpretation***Viewing: currently available viewers and workstationsReading: 4D-movie vs automatic tracking on 2D-image***3. Clinical applications and current achievements*** Airways: tracheal stenosis, tracheobronchomalacia, asthma, COPDAround tumors: preoperative analysis of pleural invasion or adhesionInside the lung: heterogeneity of motion in COPD and transplanted lung***4. Future use***Automated analysis for the airway, lung, and pleura

CH216-ED-THB8 A Wolf in Sheep's Clothing - Lung Cancers with Benign Features on CT

Station #8

Participants
Maria D. Martin, MD, Madison, WI (*Presenter*) Nothing to Disclose
Cristopher A. Meyer, MD, Madison, WI (*Abstract Co-Author*) Stockholder, Cellectar Biosciences, Inc Investor, NeuWave, Inc
Lynn S. Broderick, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Jeffrey P. Kanne, MD, Madison, WI (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation; Advisory Board, F. Hoffmann-La Roche Ltd

TEACHING POINTS

Certain lung cancer morphologies can be confused with non-malignant conditions Illustrate and compare ambiguous imaging findings in cases of biopsy proven lung cancers Discuss how data in this era of lung cancer screening and volumetric CT provides insight into the many manifestations of lung cancer Describe strategies to avoid misclassifying lung cancers as benign lesions

TABLE OF CONTENTS/OUTLINE

Examples of lung cancers with morphologic characteristics more typical of benign processes (in parenthesis) Cavity/Cyst will progressive wall thickening (inflammation) Consolidation (pneumonia) Linear opacity (atelectasis) Filling defect in cavities (aspergilloma) Pseudocentral calcification (granuloma) Fat attenuation lesion (hamartoma) Tree-in bud opacity (bronchopneumonia) Distal mucocele (bronchial atresia)Each case will be analyzed, and strategies to avoid misdiagnosis will be discussed

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/

Jeffrey P. Kanne, MD - 2012 Honored Educator
Jeffrey P. Kanne, MD - 2013 Honored Educator

SPSH52

Hot Topic Session: Dual Energy Chest CT: Ready for Prime Time?

Thursday, Dec. 1 3:00PM - 4:00PM Room: S402AB

CH CT

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Sub-Events

SPSH52A Lung Parenchyma

Participants
Jonathan G. Goldin, MBChB, PhD, Los Angeles, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Understand how with use of recently developed dual-energy CT (DECT) techinque, the clinical utility of CT in the management of pulmonary diseases can be expanded.2. Understand how this technology provides novel insights into perfusion and ventilation not possible with conventional CT.3. Understand how use of virtual monochromatic imaging can lead to a new approach to pulmonary imaging.4. Be familiar with the protocols needed for the clinical application of DECT in the chest disease.

SPSH52B Oncology

Participants
Myrna C. Godoy, MD, PhD, Houston, TX, (mgodoy@mdanderson.org) (*Presenter*) Research Grant, Siemens AG

LEARNING OBJECTIVES

1) To review the basic physical principals of dual-energy CT (DECT). 2) To discuss novel applications of DECT in thoracic oncologic imaging.

ABSTRACT

Dual energy CT is a relatively new technique with the main advantage of increased iodine conspicuity (low kVP/kVe imaging) and possibility to obtain material specific imaging (material decomposition). The potential applications of DECT in thoracic oncology include: pulmonary nodule characterization for determination of malignancy, refinement of tumor staging, evaluation of mediastinal masses, evaluation of nodal disease, characterization of pleural disease, preoperative evaluation for prediction of pulmonary function following lung resection, radiotherapy planning, and assessment of tumor response to the therapy.

URL

SPSH52C Vascular

Participants
Moritz H. Albrecht, MD, Charleston, SC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss dual-energy applications for imaging of pulmonary embolism. 2) Select suitable dual-energy CT image acquisition protocols. 3) Identify post-processing advantages for vascular imaging inherent to dual-energy CT.

RC701

Imaging of Pulmonary Fibrosis

Thursday, Dec. 1 4:30PM - 6:00PM Room: E450A

CH CT

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

FDA Discussions may include off-label uses.

Participants
David A. Lynch, MBBCh, Denver, CO (*Moderator*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc

LEARNING OBJECTIVES

1) Understand the current clinical approach to diagnosis and management of pulmonary fibrosis. 2) Identify the major CT imaging features of the idiopathic interstitial pneumonias based on the revised ATS/ERS diagnostic criteria for IPF. 3) Differentiate idiopathic pulmonary fibrosis from nonspecific interstitial pneumonia and chronic hypersensitivity pneumonitis. 4) Identify important complications of IPF. 5) Recognize the clinical implications of early interstitial abnormalities identified in asymptomatic subjects. 6) Understand evolving role of quantitative CT in assessment of lung fibrosis.

ABSTRACT

Recent clinical trials in idiopathic pulmonary fibrosis (IPF) have resulted in approval of two new treatments for this condition. Given the central role of the radiologist in making the CT diagnosis of IPF, it is critical to understand the diagnostic criteria for this condition, as recently revised by the ATS/ERS, and to distinguish it from other fibrosing interstitial pneumonias including nonspecific interstitial pneumonia (NSIP), connective tissue disease related lung fibrosis (CVD-ILD), and chronic hypersensitivity pneumonitis (HP). Interstitial lung abnormalities on CT. The radiologist also has an important role in identifying complications of lung fibrosis including acute exacerbations and lung cancer. Substantial advances have been made in developing CT techniques for quantification of lung fibrosis, which correlate with clinical severity and with mortality.This course will begin with a discussion by an expert pulmonologist of the clinical approach to diagnosis of lung fibrosis. This will be followed by a description of the imaging features of the fibrosing interstitial pneumonias. The course will review evolving diagnostic criteria for UIP and provide guidance for dealing with asymptomatic early interstitial abnormalities identified on CT. The methodology, value and limitations of quantitative assessment methods will be discussed.

Sub-Events

RC701A Advances in Management of Pulmonary Fibrosis

Participants
Imre Noth, MD, Chicago, IL (*Presenter*) Speakers Bureau, Sumitomo Dainippon Pharma Co, Ltd; Speakers Bureau, F. Hoffmann-La Roche Ltd ; Speakers Bureau, Boehringer Ingelheim GmbH; Consultant, ImmuneWorks, Inc; Consultant, Gilead Sciences, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Boehringer Ingelheim GmbH

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701B Fibrosing Interstitial Pneumonia: How to Sort Out the IP´s

Participants
Justus E. Roos, MD, Durham, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701C Critical Issues in Imaging of Idiopathic Pulmonary Fibrosis

Participants
David A. Lynch, MBBCh, Denver, CO (*Presenter*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701D Quantification of Pulmonary Fibrosis

Participants
Joseph Jacob, MBBS, MRCP, London, United Kingdom, (joseph.jacob@nhs.net) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC718

Imaging Cancer Treatment Complications: New Challenges (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: S103AB

CH GI MK OI

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC718A Pulmonary Complications

Participants
Michelle S. Ginsberg, MD, New York, NY, (ginsberm@mskcc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize complications in the postoperative thoracic patient in both immediate and late periods. In the immediate period this will include lobar collapse, hemorrhage, pulmonary edema, pneumonia, as well as rarer complications such as bronchopleural fistula, chylothorax and lung torsion. In the later period it is important to follow these patients and to recognize and distinguishing recurrent tumor from treatment changes and new primary tumors.

ABSTRACT

RC718B GI Complications

Participants
Nina Tunariu, MD, Sutton, United Kingdom, (nina.tunariu@icr.ac.uk) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be familiar with classification of novel targeted and standard anticancer drugs. 2) Able to identify GI toxicity imaging appearances by understanding the mechanisms of action of the chemotherapeutic agents. 3) Be aware that toxicities can be asymptomatic and that radiologists are instrumental in identifying and reporting early manifestations of toxicities. 4) Describe the imaging appearance of GI complications of anti-cancer therapy. 5) Differentiate between post-therapeutic changes and disease progression.

ABSTRACT

RC718C Musculoskeletal Complications

Participants
Hassan Douis, MRCP, FRCR, Birmingham, United Kingdom (*Presenter*) Spouse, Grant, Eisai Co, Ltd; Spouse, Grant, Pharma Mar SA

LEARNING OBJECTIVES

1) To describe common chemotherapy-induced, radiation-therapy induced and surgical complications of the musculoskeletal system2) To recognize early and late musculoskeletal complications of oncological treatment3) To describe the imaging features of common musculoskeletal complications of oncological treatment

ABSTRACT

RC801

Imaging of Cardiothoracic Emergencies (An Interactive Session)

Friday, Dec. 2 8:30AM - 10:00AM Room: E353C

CH ER

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

Participants

LEARNING OBJECTIVES

1) To review imaging manifestations of common life-threatening complications of thoracic trauma. 2) To highlight common difficulties radiologists encounter when interpreting imaging studies in patients with thoracic trauma. 3) Overview current imaging strategies and key facts in Pulmonary Embolism imaging. 4) Provide an update on current issues and challenges in Pulmonary Embolism imaging.

Sub-Events

RC801A Thoracic Trauma

Participants
Santiago Martinez-Jimenez, MD, Kansas City, MO (*Presenter*) Author, Reed Elsevier; Author, Oxford University Press

LEARNING OBJECTIVES

1) To review imaging manifestations of common life-threatening complications of thoracic trauma. 2) To highlight common difficulties radiologists encounter when interpreting imaging studies in patients with thoracic trauma.

ABSTRACT

Thoracic trauma is common, may imply life-threatening complications, and could be especially challenging for radiologists. Several reasons known to add complexity of interpretation of imaging studies include: lack of direct interaction with patients, unawareness of the mechanism of trauma, inherent poor diagnostic quality, satisfaction of search, and lack of knowledge of resultant pathophysiologic mechanisms. In this case based lecture several scenarios are presented with detailed analyses of imaging studies, mechanisms of trauma and pertinent involved pathophysiological principles. Some of the cases included are: acute traumatic aortic injury, diaphragmatic rupture, airway injury, aspiration, flail chest, and stenoclavicular dislocation.

Active Handout:Santiago Martinez-Jimenez

http://abstract.rsna.org/uploads/2016/16000670/RC801A Trauma RSNA 2016 003.pdf

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Santiago Martinez-Jimenez, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2015 Honored Educator

RC801B Pulmonary Embolism

Participants
Ioannis Vlahos, MRCP, FRCR, London, United Kingdom, (johnny.vlahos@stgeorges.nhs.uk) (*Presenter*) Research Consultant, Siemens AG; Research Consultant, General Electric Company;

LEARNING OBJECTIVES

1) Overview current imaging strategies and key facts in Pulmonary Embolism imaging. 2) Provide an update on current issues and challenges in Pulmonary Embolism imaging.

ABSTRACT

Honored Educators

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

RC801C Acute Aortic Syndrome

Participants
Jonathan H. Chung, MD, Chicago, IL (*Presenter*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc

Honored Educators

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Jonathan H. Chung, MD - 2013 Honored Educator

RC801D Acute Coronary Syndrome

Participants
Harold I. Litt, MD, PhD, Philadelphia, PA (*Presenter*) Research Grant, Siemens AG ; Research Grant, Heartflow, Inc; Travel Support, General Electric Company;

LEARNING OBJECTIVES

1) Understand the demographics and clinical presentations of patients with suspected acute coronary syndromes and the pathways and guidelines used in their care. 2) Describe the evidence supporting the use of coronary CT angiography, SPECT myocardial perfusion imaging and stress echocardiography in low to intermediate risk chest pain patients. 3) Demonstrate typical findings at coronary CT angiography in patients with suspected acute coronary syndromes.

SST03

Chest (Lung Cancer Screening)

Friday, Dec. 2 10:30AM - 12:00PM Room: E451B

CH CT

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

FDA Discussions may include off-label uses.

Participants
Sudhakar N. Pipavath, MD, Mercer Island, WA (*Moderator*) Consultant, Boehringer Ingelheim GmbH; Advisor, Boehringer Ingelheim GmbH; Speaker, Boehringer Ingelheim GmbH
Girish S. Shroff, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SST03-01 The Vancouver Lung Cancer Risk Prediction Model: Assessment using a Subset of the National Lung Screening Trial Cohort

Friday, Dec. 2 10:30AM - 10:40AM Room: E451B

Participants
Charles S. White, MD, Baltimore, MD (*Presenter*) Consultant, Koninklijke Philips NV
Ekta D. Dharaiya, MS, Highland Heights, OH (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Erin Campbell, BS, Briarcliff Manor, NY (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Jason W. Mitchell, MD, Ellicott City, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the likelihood of malignancy among a subset of nodules in the National Lung Screening Trial (NLST) using a risk calculator based on nodule and patient characteristics.

METHOD AND MATERIALS

All authors received approval for use of NLST data. Nodule characteristics and patient attributes of benign and malignant nodules in the NLST were applied to the nodule risk calculator described by McWilliams et al. of Vancouver, Canada. Patient populations and their nodule characteristics were compared between the NLST and Vancouver cohorts. Based on output from the risk calculator, multiple thresholds were tested to distinguish a benign from malignant nodule using the NLST dataset. An optimized threshold value was used to determine positive and negative predictive values and a full logistic regression-model was applied to the NLST dataset.

RESULTS

Sufficient data were available for 4,431 nodules (benign = 4315, malignant = 116) from the NLST dataset. The NLST and Vancouver datasets differed in that the former included fewer nodules per study (likely due to use of a higher size cut off for designating a nodule as actionable) and fewer non-solid nodules as well as more nodule spiculation and emphysema. A threshold value of 10% was determined to be optimal, demonstrating sensitivity, specificity, positive and negative predictive values of 85.3%, 93.9%, 27.4%, and 99.6%, respectively. The ROC curve for the full regression model applied to the NLST database revealed AUC = 0.963 (0.945, 0.974).

CONCLUSION

Application of an NLST data subset to the Vancouver risk calculator yielded a high discriminant value, supporting the use of risk calculator methodology as a valuable approach to distinguish between benign and malignant nodules.

CLINICAL RELEVANCE/APPLICATION

Improved discriminant value in designating nodules as benign or malignant can result in refinement of follow-up strategies for patient evaluation and management, which may lead to a reduction in cost of care and allay patient anxiety.

SST03-02 Accuracy of the PanCan Risk Model for Predicting Cancer in Screen-Detected Nodules Compared With Trainee and Experienced Radiologists

Friday, Dec. 2 10:40AM - 10:50AM Room: E451B

Participants
Heber MacMahon, MD, Chicago, IL (*Presenter*) Consultant, Riverain Technologies, LLC; Stockholder, Hologic, Inc; Royalties, UCTech; Research support, Koninklijke Philips NV; Consultant, General Electric Company
Feng Li, MD, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Samuel G. Armato III, PhD, Chicago, IL (*Abstract Co-Author*) Consultant, Aduro Biotech, Inc

PURPOSE

A lung cancer risk assessment model known as the Brock or PanCan model, which incorporates nodule features in addition to other risk factors, has been tested on a screening population, with impressive results. Therefore, we conducted an observer performance test to compare the accuracy of the model with that of radiologists in a simulated clinical environment.

METHOD AND MATERIALS

One hundred cases from the National Lung Screening Trial (NLST) Database were selected in the size range of 4-25 mm, including 20 proven cancers and 80 size-matched benign nodules. Three experienced thoracic radiologists and three trainee radiologists were

asked to estimate the likelihood of cancer in each case first without, and then with, the use of the model. The results for the model using both automated and manual feature extraction were also compared through ROC analysis. The areas under the ROC curves for each viewing condition were calculated, and statistical significance was estimated using De Long's test.

RESULTS

Experienced radiologists and trainees were more accurate than the model in estimating the risk of malignancy in size-matched, screen-detected nodules (P<0.001), and both groups had lower accuracy when using the model. Experienced radiologists performed better than trainees and were less influenced by the model. Review of individual cases revealed that observers could better distinguish benign from malignant nodule morphology compared with the model.

CONCLUSION

Experienced and trainee radiologists had superior ability to predict the risk of cancer in size-matched nodules from a screening trial compared with the Brock (PanCan) model, and use of the model resulted in a decrease in radiologist accuracy. The possible reasons for this result will be discussed.

CLINICAL RELEVANCE/APPLICATION

Despite impressively high overall accuracy in a screening population, use of the PanCan model failed to improve the accuracy of radiologists in predicting the risk of cancer in an observer test using screen-detected nodules.

SST03-03 Lung-RADS Category 4X: Does It Improve Prediction of Malignancy in Screen-Detected Subsolid Nodules?

Friday, Dec. 2 10:50AM - 11:00AM Room: E451B

Participants
Kaman Chung, MD, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Colin Jacobs, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research Grant, Varian Medical Systems, Inc
Ernst T. Scholten, MD, Haarlemmerliede, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Francesco Ciompi, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Paul K. Gerke, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Helmut Prosch, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Nicola Sverzellati, Parma, Italy (*Abstract Co-Author*) Nothing to Disclose
Mathias Prokop, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG Speakers Bureau, Bracco Group Speakers Bureau, Toshiba Corporation Speakers Bureau, Koninklijke Philips NV Research Grant, Toshiba Corporation
Bram Van Ginneken, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV; Research Grant, MeVis Medical Solutions AG; Research Grant, Delft Imaging Systems; Research Grant, Toshiba Corporation;
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC

PURPOSE

Lung-RADS category 4X allows radiologists to upgrade Lung-RADS category 3, 4A and 4B nodules to a higher risk-group if deemed as more suspicious, triggering a more intense work-up. Purpose of this study was to retrospectively estimate the probability of malignancy of Lung-RADS nodule categories 3, 4A, 4B and 4X for subsolid nodules (SSNs) in the National Lung Screening Trial (NLST) cohort.

METHOD AND MATERIALS

Based on recorded nodule size, we identified all baseline scans from the NLST database in which SSNs were recorded and would have been classified as Lung-RADS category 3 or higher. An experienced screening radiologist volumetrically segmented all solid cores and assigned categories 4A and 4B based on core size. He also located all malignant SSNs visible on the baseline scans. Four experienced chest radiologists were independently asked to determine which nodules to upgrade to 4X. We compared malignancy rates of pure size-based categories to those including category 4X.

RESULTS

We identified 47 non-solid ≥ 20 mm and 348 part-solid nodules ≥ 6 mm in the records of NLST baseline scans. Nodule identification on the scan was possible in 95% of the lesions, resulting in 374 nodules for analysis. Among these, 17 category 3, 11 category 4A, and 28 category 4B lesions turned out to be cancers during the follow-up period. The four observers upgraded a nodule to 4X in 15-20% of all cases. Pure size-based malignancy rates were 9% for category 3, 19% for 4A and 23% for 4B. Depending on the observer, malignancy rates increased to 52-57% for category 4X. On average, 59% of malignancies among category 3 nodules, 45% among 4A and 68% among 4B nodules were upgraded to 4X by the observers. After reclassifying nodules to 4X the malignancy rates in the remaining nodules dropped to 4% for category 3, 12% for category 4A and 11% for category 4B.

CONCLUSION

Lung-RADS category 4X substantially improves prediction of malignancy in subsolid nodules and is associated with a > 50% malignancy rate independent of the observer.

CLINICAL RELEVANCE/APPLICATION

Lung-RADS category 4X is associated with a high malignancy rate in subsolid nodules and justifies a more aggressive management approach.

SST03-04 Lung-RADS Category 4X for Screen-detected Subsolid Nodules: Do Radiologists Agree with Each Other?

Friday, Dec. 2 11:00AM - 11:10AM Room: E451B

Participants
Kaman Chung, MD, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Colin Jacobs, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research Grant, Varian Medical Systems, Inc
Ernst T. Scholten, MD, Haarlemmerliede, Netherlands (*Abstract Co-Author*) Nothing to Disclose

Francesco Ciompi, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Paul K. Gerke, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Helmut Prosch, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Nicola Sverzellati, Parma, Italy (*Abstract Co-Author*) Nothing to Disclose
Mathias Prokop, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG Speakers Bureau, Bracco Group Speakers Bureau, Toshiba Corporation Speakers Bureau, Koninklijke Philips NV Research Grant, Toshiba Corporation
Bram Van Ginneken, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV; Co-founder, Thirona BV; Research Grant, MeVis Medical Solutions AG; Research Grant, Delft Imaging Systems; Research Grant, Toshiba Corporation;
Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC

PURPOSE

Lung-RADS category 4X provides the option to radiologists to upgrade nodules of categories 3, 4A and 4B to a higher risk group, triggering a more intense management, if they consider the lesions more suspicious. This introduces a subjective observer component in the nodule management process. Purpose of this study was to determine the inter-observer variability of this category among radiologists for subsolid nodules (SSNs).

METHOD AND MATERIALS

We included all baseline scans from the National Lung Cancer Trial (NLST) database in which an SSN was recorded and would have been classified as Lung-RADS category 3 or higher. An experienced screening radiologist segmented all solid cores using in-house software (Cirrus Lung Screening) and identified all lung cancer nodules on the scans, as the NLST does not provide actual lesion coordinates. Four experienced chest radiologists were asked to determine which SSNs should be upgraded to 4X. Inter-observer variability was assessed using Kappa statistics.

RESULTS

Retrospective identification of the nodule on the scan was possible in 95% of the SSNs. This resulted in a total of 374 SSNs to be classified as at least Lung-RADS category 3 and available for the observer study. Fifty-six nodules were eventually diagnosed as malignant and visible at T0 (baseline scan). Twenty-eight were diagnosed at T0, 16 at T1, 5 at T2 and 7 in later years. Inter-observer agreement was moderate with a mean kappa value of 0.539 (range 0.451 – 0.589). All four observers agreed on category 4X in 61% of the cancers diagnosed at baseline, but in only in 11% of the cancers diagnosed at a later stage. Agreement remained moderate for subgroups of categories 3, 4A and 4B nodules (mean kappa 0.531, 0.418 and 0.537 respectively). At least 1 of the 4 observers upgraded a malignant SSN to category 4X in 89% of the baseline cancers and 79% of those diagnosed after baseline.

CONCLUSION

Inter-observer agreement for upgrading SSNs to 4X is moderate. The fact that the majority of subsolid nodules later diagnosed as malignant were assigned to category 4X by at least one radiologist already at baseline, suggests the presence of visually accessible morphological features for nodule classification.

CLINICAL RELEVANCE/APPLICATION

The moderate inter-observer agreement for upgrading subsolid nodules from Lung-RADS category 3, 4A and 4B to 4X suggests that efforts should be made to further define features for this category.

SST03-05 Lung Cancer Growth Rates in the NLST: Does Sex Matter?

Friday, Dec. 2 11:10AM - 11:20AM Room: E451B

Participants
Phillip M. Boiselle, MD, Boston, MA (*Presenter*) Nothing to Disclose
Caroline Chiles, MD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose
Stavroula Chysanthopoulou, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Fenghai Duan, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Judith K. Amorosa, MD, Somerville, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate volume doubling times (VDTs) among CT screen-detected lung cancers (LCs), stratified by sex and nodule consistency.

METHOD AND MATERIALS

From a random sample of 200 LC cases diagnosed following positive incidence screens in the NLST-CT arm, we performed a retrospective analysis of 173 LC cases (89 men, 84 women) with measurable lesions and images available for review. A nodule/mass within the LC lobe specified in the NLST database was identified on each participant's final CT screen and matched to a nodule on ≥1 prior CT-screens. Nodule consistencies (solid=SN, part-solid=PSN, non-solid=NSN) and volumes were determined by 2 readers using segmentation analysis and tracking tools on 3D-workstations. VDTs were calculated for each LC and categorized by growth rate (in days): very fast (<100), fast (101-400), intermediate (401-800), and slow (>801). VDTs and LC mortality were compared in men and women by nodule consistency.

RESULTS

Overall mean nodule VDTs were significantly faster for men than for women (536 ± 600 vs 1108 ± 2054, P=0.00142). In men, the most common LC pattern was a fast- to intermediate-growing SN [51 (57.3%) of 89 LCs, mean VDT = 420 ± 515 days]. In women, the most common LC pattern was a slow-growing PSN [45 (53.6%) of 84 LCs, mean VDT 1371 ± 2590 days]. LC mortality was significantly higher for men than women for both SNs and PSNs (SNs, 35.3% vs. 6.1%, P=0.0050; PSNs, 25.8% vs. 9.5%, P=0.0094). Similarly, nodule VDTs were significantly faster for men than women for both SNs and PSNs (SNs, 420 ± 515 days vs 717 ± 1148, P=0.0983; PSNs, 646 ± 677 vs 1371 ± 2590, P=0.0249). Potentially overdiagnosed LCs included 36 (20.8%) of 173 LCs with a VDT > 800 days, including 19 (22.6%) of 84 LCs in women and 17 (19.1%) of 89 LCs in men (P=0.7022).

CONCLUSION

Screen-detected LCs differ by sex and most commonly present as fast- to intermediate-growing SNs in men and slow-growing PSNs in women. The rate of potentially overdiagnosed LCs did not differ significantly by sex.

CLINICAL RELEVANCE/APPLICATION

Differences in growth rates of screen-detected LC between men and women suggest the need to personalize nodule management algorithms by sex for both SNs and PSNs.

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/

Phillip M. Boiselle, MD - 2012 Honored Educator

SST03-06 A Retrospective Lung Cancer Screening Study with and without a Computer-Aided LDCT System Consisting of Vessel Suppression Function and CADe Marks

Friday, Dec. 2 11:20AM - 11:30AM Room: E451B

Participants
Shih-Chung B. Lo, PhD, Arlington, VA (*Abstract Co-Author*) Institutional research contract, Riverain Technologies, LLC
Matthew T. Freedman, MD, MBA, Baltimore, MD (*Abstract Co-Author*) Institutional research contract, Riverain Technologies, LLC
Laura Gillis, PhD, Mount Airy, MD (*Abstract Co-Author*) Nothing to Disclose
Charles S. White, MD, Baltimore, MD (*Presenter*) Consultant, Koninklijke Philips NV

PURPOSE

The study was performed to determine if there was improvement of radiologists' performance in detecting actionable nodules on thoracic CT when aided by a computer-aided detection (CADe) system consisting of a vessel suppression function and CADe marks.

METHOD AND MATERIALS

A novel CADe system, which is capable of vessel suppression while not suppressing potentially actionable nodules, was developed to assist radiologists in reading thoracic CT. Twelve radiologists participated in a comparative study without and with the CADe. 324 LDCT cases in a 2:1 nodule-free-to-nodule ratio were used for the study. Approximately 90% of these cases were selected from among NLST stage 1A cancer cases with two matched normal cases. Both receiver operating characteristic (ROC) and localized receiver operating characteristic (LROC) methods were used for analysis.

RESULTS

In a stand-alone analysis, CADe detected 89.5% and 82.0% of cancer lesions and all nodule lesions, respectively. The corresponding false positive rate per CT scan was 0.747. All cases were blind to the CADe system prior to the reader study. The performance of each reader and the combined result showed improvement. For the reader study, the area under the combined LROC curve increased significantly from 0.633 unaided to 0.773 aided by CADe ($P = 7.3 E-05$) for the detection of lung cancer. The area under the combined LROC curve increased significantly from 0.584 unaided to 0.693 aided ($P = 0.0005$) for the detection of all actionable nodules, benign and malignant. Readers detected 80.0% of the cancers when using the aided system versus 64.45% when unaided ($P = 2.5E-05$); specificity decreased from 89.9% to 84.4% ($P = 0.0025$). Radiologist read time significantly decreased by an average of 26% per case when aided as compared to unaided.

CONCLUSION

Radiologists using the CADe system significantly increased their detection of lung cancers and actionable benign nodules with somewhat lower specificity. The vessel suppressed series allowed radiologists to increase their reading speed by a factor of ~1/4.

CLINICAL RELEVANCE/APPLICATION

Our study suggests that the use of the novel vessel subtraction based CADe approach has the potential to assist the radiologist in the detection of more actionable nodules on thoracic CT and to do so more expeditiously than without CADe.

SST03-07 Incidental Findings and Extrapulmonary Malignancies in Participants Screened with Chest CT in the National Lung Screening Trial

Friday, Dec. 2 11:30AM - 11:40AM Room: E451B

Participants
Xuan V. Nguyen, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Louise Davies, MD,MS, Hanover, NH (*Abstract Co-Author*) Nothing to Disclose
Jenny K. Hoang, MBBS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To estimate prevalence and malignancy rates of incidental extrapulmonary findings on low-dose chest CT for lung cancer screening.

METHOD AND MATERIALS

Prospectively acquired data on 17309 participants who underwent low-dose screening chest CT from August 2002 through September 2007 during the National Lung Screening Trial (NLST) were retrospectively analyzed for incidental extrapulmonary findings. NLST radiologist readers coded incidentally detected findings as "minor" or "potentially significant". This study also assigned incidental findings to five organ groupings (cardiovascular, thyroid, adrenal, renal, and hepatobiliary) and categories based on descriptors of morphology. The prevalences of organ-specific incidental findings were calculated, and data on newly diagnosed extrapulmonary malignancies during the NLST were used to estimate malignancy rates among incidental findings. Exemption from human subjects research review was obtained.

RESULTS

58.7% (95% CI: 58.0-59.5%) of CT screened participants had incidental findings, and 19.6% (95% CI: 19.0-20.2%) of participants had incidental findings that were coded as potentially significant. Prevalence of potentially significant abnormalities among

participants was highest for cardiovascular findings (8.5%), followed by renal (2.4%), hepatobiliary (2.1%), adrenal (1.2%) and thyroid (0.6%) lesions. 67 (0.4%; 95% CI: 0.3-0.5%) participants had cancers diagnosed during screening. Among focal lesions regarded as potentially significant, thyroid lesions had the highest malignancy rate (8.1%), followed by renal lesions (3.0%).

CONCLUSION

Indiscriminate workup of incidental findings detected on CT lung cancer screening could place a significant burden on patients and the healthcare system with little benefit since incidental findings are extremely common, but extrapulmonary malignancies diagnosed during screening are rare.

CLINICAL RELEVANCE/APPLICATION

Programs participating in CT lung screening should be provided with recommendations for reporting incidental findings in order to minimize unnecessary workup in low-risk lesions.

SST03-08 Computed Tomographic Findings are Associated with Respiratory Mortality in the National Lung Screening Trial

Friday, Dec. 2 11:40AM - 11:50AM Room: E451B

Awards
Student Travel Stipend Award

Participants
Esther Pompe, MD, Utrecht, Netherlands (*Presenter*) Nothing to Disclose
Firdaus Mohamed Hoesein, MD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc
Nikolas Lessmann, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Jan-Willem J. Lammers, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Ivana Isgum, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Research Grant, Pie Medical Imaging BV Research Grant, 3mensio Medical Imaging BV
Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Almost 10% of all deaths in the computed tomography (CT) arm of the National Lung Cancer Screening Trial (NLST) were due to respiratory illnesses other than lung cancer. We evaluated the importance of lung abnormalities on screening CT for survival in NLST participants.

METHOD AND MATERIALS

Subjects were derived from the CT-arm of the NLST that died of a respiratory illness other than lung cancer, as defined on the death certificate, matched with an equal number of control subjects, based on age, sex, pack-years, and smoking status. A chest radiologist and senior radiology resident independently and blindly scored baseline CTs for the presence of emphysema, airway wall thickening, or fibrotic lung disease. Associations between CT abnormalities and death was evaluated with a logistic regression model.

RESULTS

172 died from a respiratory cause other than lung cancer. Radiologic diseases were significantly associated with higher mortality; severe emphysema OR (95%CI) 9.7 (4.6– 20.4), airway wall disease OR (95%CI) 2.3 (1.3–3.9) or fibrotic lung disease OR (95%CI) 39.1 (5.1–289.6). 81 subjects were evaluated by the EVP and confirmed the diagnosis in 55 subjects. In this group, the presence of severe emphysema was significantly associated with mortality (OR=17.2, $p<0.001$), as well as airway remodeling (OR=3.2, $p=0.01$). In the 26 non-confirmed subjects no significant difference in CT lung abnormalities between participants who were alive and participants who died was found.

CONCLUSION

CT-diagnosis of fibrosis, emphysema, airway remodeling are important for survival. By screening CT-scans for these abnormalities, next to lung cancer, deaths related to respiratory causes other than lung cancer may be preventable."The authors thank the National Cancer Institute for access to NCI's data collected by the National Lung Screening Trial. The statements contained herein are solely those of the authors and do not represent or imply concurrence or endorsement by NCI."

CLINICAL RELEVANCE/APPLICATION

CT-diagnosis of fibrosis, emphysema, and airway remodeling are important for survival in lung cancer screening.

SST03-09 Low Dose CT for Screening of Lung Cancer in High Risk Nonsmokers: A Multicenter Study

Friday, Dec. 2 11:50AM - 12:00PM Room: E451B

Participants
Yung-Liang Wan, MD, Taoyuan City, Taiwan (*Presenter*) Nothing to Disclose
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Ying-Huang Tsai, MD, Chiayi, Taiwan (*Abstract Co-Author*) Nothing to Disclose
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Chong-Jen Yu, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Pan-Chyr Yang, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study the prevalence of lung cancer in high risk non-smokers using low dose CT (LDCT).

METHOD AND MATERIALS

This was a prospective, nationwide and multicenter study sponsored by The Ministry of Health and Welfare. In a period from Feb. 2015 to Dec. 2015, 4,498 subjects (aged 33 to 75, mean age 61.6, 3.365 females) underwent LDCT for lung cancer screening. The major inclusion criteria were ages between 55-75, non-smoking or light ex-smoking history (< 10 pack-year and had quit > 15 years), and having one of the following risk factors: family history of lung cancer (n = 1,738, 38.9%), environmental tobacco smoking exposure (n = 3,382, 75.2%), TB/COPD history (n = 334, 7.4%), cooking index ≥ 110 (n = 1,769, 39.3%), and not using ventilator during cooking (n = 197, 4.4%). The LDCT was conducted mainly according to the guideline suggested by American College of Radiology. The mean effective radiation dose of LDCT was 1.064 mSv (SD = 0.316 mSv). A solid or part-solid (PS) nodule larger than 6 mm or pure ground glass nodule (GGN) larger than 5 mm in diameter was designated as positive finding on LDCT. Each Institute Review Board approved the project and an informed consent was obtained from each subject.

RESULTS

Of 4,498 subjects, 4.395 (97.7%) conformed to the inclusion criteria. Among them, 19.9% of the subjects were considered positive on LDCT and 1.64% (n = 72) underwent invasive procedures. The final pathology showed 2 cases of atypical adenomatous hyperplasia, 14 cases of benign lesions, and 56 (1.27%) cases of lung cancer (adenocarcinoma in situ or AIS = 6, minimally invasive adenocarcinoma or MIA = 10, invasive adenocarcinoma or IVA = 40). Of 56 patients with lung cancer, 96% were stage I or less. The nodule of 6 AIS were GGN in 4, PS in 2, the nodule of the 10 MIA featured GGN in 6, PS in 4, and that of 40 IVA were GGN in 17, PS in 20, and solid in 3. The mean diameter ± SD of AIS, MIA and IVA were 11.50 ± 4.35, 11.77 ± 5.52, 13.4 ± 6.86, respectively.

CONCLUSION

Our study disclosed that the detection rate of lung cancer in high risk non-smokers by LDCT was comparable to that of the high risk smoking group in National Lung Screening Trial.

CLINICAL RELEVANCE/APPLICATION

Risk factors other than active smoking play a significant role in the etiologies of lung cancer in this area. LDCT might be used to screen lung cancer in high risk population without active smoking.