

# Posters



**Society of Thoracic Radiology  
Scientific Posters  
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- 101 Pictorial Review of 64-detector MDCT Coronal Reformations of the Chest: Advantages and Disadvantages in Demonstrating Thoracic Abnormalities  
*Mizuki Nishino, MD*
- 102 Thoracic Aortic Diseases: A Comprehensive Review with Multi-modality Imaging Features and Therapeutic Implications  
*Mizuki Nishino, MD*
- 103 Developing 64-channel Coronary Artery CT Initial Experience  
*Caroline Cranford, MD, MBA*
- 104 Congenital Heart Disease: Image Diary Using 40 and 64 MDCT  
*Caroline Cranford, MD, MBA*
- 105 The Prevalence and Significance of Increased Gastric Wall Radiotracer Uptake in Sestamibi Myocardial Perfusion SPECT  
*Mohammad Eftekhari, MD*
- 106 Pulmonary Nocardiosis in Post Lung Transplant Recipients - CT Manifestations  
*Peter Simons, MD*
- 107 MDCT and MR Imaging of Cardiac Neoplasms  
*Shalin Amin, MD*
- 108 PTLD - Imaging Findings and Histopathologic Correlation  
*Phillip Beiselle, MD*
- 109 Multidetector CT Imaging of Central Airway Neoplasms  
*Karen Lee, MD*
- 110 What Happened to Well's?  
*Mary Costantino, MD*
- 111 Cavities in the Lung - Usual, Unusual and New Oncological Etiologies  
*Ritu R. Gill, MD*
- 112 Spectrum of Complications in Lung Transplant  
*Ritu R. Gill, MD*

## Scientific Posters

- 113 Cardiopulmonary Findings on CT Pulmonary Angiography in Patients with Suspected Pulmonary Embolus  
*Shalin J. Amin, MD*
- 114 Variability of Contrast Enhancement of the Pulmonary Arteries during 64-slice Coronary CT Angiography  
*Olivier M. Vanovermeire, MD*
- 115 Non-Contrast Cardiac CT Precisely Measures the Sinotubular Junction  
*Douglas Johnson, DO*
- 116 Free-breathing Non-Contrast VIBE MR-Angiography of the Lung Using ECG Triggering and Respiratory Gating: Image Quality Assessment  
*Julia Zaporozhan, MD*
- 117 CT Features of Pulmonary Septic Emboli: Comparison between Causative Microorganisms  
*Yeon Joo Jeong, MD*
- 118 Iatrogenic Nonthrombotic Pulmonary Embolism: Diagnosis and Significance  
*Diana Palacio, MD*
- 119 Repair Through a Keyhole: What Every Radiologist Should Know About Minimally Invasive Cardiac Valve Surgery  
*Jason Handwerker, MD*
- 120 Lung Tumor Measurements: Different Approaches in The Era of Volumetric CT  
*Naama R. Bogot, MD*
- 121 Application of the Optical Flow Method to Pre-and Post-contrast MDCT Volumetric Lung Imaging for Assessment of Regional Pulmonary Enhancement - A Feasibility Report  
*Drew A. Torigian, MD, MA*
- 122 A Pictorial Review of CT Findings in Fungal Diseases of the Chest  
*E. P. Smith, BSc, MBChB, MRCP, FRCR*
- 123 MDCT Analysis of Drainage Patterns of the Pulmonary Veins and Pulmonary Vein Diameter and Distance to First Bifurcation  
*Paul Cronin, MBBCh BAO, MS*
- 124 Clinical Experience of Cyrosurgery of Lung Cancer, Correlation with Follow Up CT Imaging  
*Soo-Youn Ham, PhD, MD*
- 125 Spectrum of Imaging Findings in Chronic Pulmonary Embolism  
*Amit Newatia, MD*
- 126 Negative Predictive Value of Combined CT Pulmonary Angiography and Indirect CT Venography in ICU  
*James Ravenel, MD*

## Scientific Posters

# Posters

- 127 Chronic Thromboembolic Pulmonary Arterial Hypertension - Pre and Post-op Imaging Findings with Surgical Correlation - An Education Exhibit  
*Salahudeen SR, MBBS, MRCP, FRCR*
- 128 Fibrosing Mediastinitis: Revisited  
*Ian Malcolm, MD*
- 129 Left Ventricular Functional Analysis with 16 and 64-row Multidetector CT: Comparison with Gated SPECT  
*Prachi P. Agarwal, MD*
- 130 Multiplanar Imaging of the Axilla  
*Santiago Martinez, MD*
- 131 Diagnosis: Lung Cancer Plain: Determine Resectability  
*Santiago Martinez, MD*
- 132 Differentiating Diaphragmatic Paralysis and Eventration with Conventional Chest Radiography  
*Peter T. Verhey, MD, MS*
- 133 Utility of Clinical Predictor Model for Suspected Acute Pulmonary Embolism in a Cancer Hospital  
*Angela E. Sroufe, PhD, MD*
- 134 Quantitative Analysis of Airway Abnormalities in Infants and Young Children with Non Cystic Fibrosis Bronchiectasis  
*Sibel Bayramoglu, MD*
- 135 Volumetric Assessment of Pulmonary Metastases Using CAD: Does Reliability Depend on Metastases Size?  
*Sandra Pauls, MD*
- 136 Dual Energy Digital Radiography of the Chest: Improved Accuracy in the Evaluation of Calcified Thoracic Pathology  
*Niusah Rafie, MD*
- 137 Value of 16-slice CT to Detect Significant Obstructive Coronary Artery Disease - Comparison with Catheter Coronary Angiography  
*Carl Chartrand-Lefebvre, MD*
- 138 Coronary CT Angiography: Systematic Review of the Literature  
*Carl Chartrand-Lefebvre, MD*

### **Pictorial Review of 64-detector MDCT Coronal Reformations of the Chest: Advantages and Disadvantages in Demonstrating Thoracic Abnormalities**

NISHINO M, Kubo T, Kataoka ML, Norihito Y, Raptoupolus V, Hatabu H

**Objectives:** Due to recent advances in MDCT technology with improved spatial and temporal resolution, there has been a growing trend in using multiplanar reformation CT images to evaluate thoracic abnormalities. In this exhibit, we describe a variety of unique demonstrations of thoracic abnormalities on coronal reformations using a 64-detector MDCT, and discuss advantages and disadvantages of coronal reformations in making diagnosis of thoracic abnormalities in comparison with conventional axial images.

**Methods/Results:** Based on our experience with the newest 64-detector scanner in clinical thoracic imaging, we describe a wide variety of unique demonstrations of thoracic abnormalities on coronal reformations, including vascular abnormalities such as aortic diseases and pulmonary embolism; cardiac abnormalities such as coronary artery calcification and stenosis; mediastinal masses and lymphadenopathy, pleural and chest wall diseases; and parenchymal abnormalities such as nodules, masses, consolidation, emphysema, bronchiectasis, and interstitial lung diseases. Volumetric coronal images with thin collimation are displayed using a cine display. The advantages and disadvantages of coronal reformations in making a diagnosis of these thoracic abnormalities are also described in comparison with conventional axial images.

**Conclusions:** Coronal reformations of chest on 64-detector MDCT provide the unique demonstrations of various thoracic abnormalities. Familiarity with these findings on coronal reformations as well as understanding of the advantages and disadvantages of coronal reformations are important for chest radiologists.

### **Thoracic Aortic Diseases: A Comprehensive Review with Multi-modality Imaging Features and Therapeutic Implications**

NISHINO M, Anderson B, Lang EV, Raptopoulos V, Hatabu H

**Objectives:** Thoracic aortic diseases often cause life-threatening conditions that require immediate diagnosis and treatment. With the recent advancement in noninvasive imaging techniques such as MDCT and MRI, imaging techniques in thoracic aortic diseases are rapidly changing. In addition, several new therapeutic implications have been suggested for thoracic aortic diseases. In this a comprehensive review, we describe the multi-modality imaging features of thoracic aortic diseases and the current therapeutic implications of these thoracic aortic diseases.

**Methods/Results:** Thoracic aortic diseases discussed in this exhibit include typical aortic dissection, intramural hematoma, penetrating aortic ulcer, and aortic aneurysm. The characteristic imaging features on chest radiographs, angiography, CT and MRI are described, along with the pathogenesis and clinical manifestations. CT and MRI features of these diseases are emphasized using multiplanar reformations and cine display. The most current therapeutic implications based on imaging findings are also discussed, in order to provide the updated knowledge.

**Conclusions:** Multi-modality imaging features and therapeutic implications of thoracic aortic diseases are described, to provide comprehensive understanding of the imaging features as well as updated knowledge of treatment options, which are necessary for chest radiologist.

### Developing 64 Channel Coronary Artery CT Initial Experience

CRANFORD C, Bardo DME, Newby B, MacMahon H, Vannier M

**Objective:** Variation in MDCT image quality of the coronary arteries is broad depending upon the number of detector channels used. Other influential factors include use of pharmacologic aids, rate and volume of contrast injection, and patient limiting factors such as body habitus, severity of calcified atherosclerosis, heart rate, and the ability to breath-hold.

**Methods:** Principal Information: The protocol for CTA of the coronary arteries utilizing 4, 16 and 40 MDCT is well established and specialized depending upon the number of detector rows. Sixteen, 40, and 64 MDCT are available at our institution. This provides us with the unique ability to compare and contrast imaging protocols and to report on our experiences.

**Results:** Images produced using scan parameters designed for use with the 40 MDCT as well as images showing development of optimal scanning techniques with 64 MDCT will be shown. Recommendations for protocol parameters and post processing techniques will be discussed.

**Conclusion:** 64 MDCT imaging of the coronary arteries requires alteration of previously established image protocols and post processing steps. Currently, patient related limiting factors remain the greatest challenge.

### Congenital Heart Disease: Image Diary Using 40 and 64 MDCT

Bardo DME, CRANFORD CM, Hijazi Z, Sandhu S, Mora B, Bichell D

**Objective:** The radiographic evaluation and post operative follow-up in children with complex congenital heart disease using 40 and 64 MDCT.

**Methods:** Principal Information: Children with congenital heart disease (CHD) are routinely examined with echocardiography and cardiac catheterization. These exams, ordered and performed by cardiologists, are the mainstay of the diagnosis of CHD and the follow-up of surgical intervention. MDCT rapidly acquires high resolution images of complex CHD anatomy with less risk and less radiation exposure than cardiac catheterization and with more detail than echocardiography.

Forty children with a variety of complex CHD including ASD, VSD, coarctation of aorta, tetralogy of Fallot, MAPCAs, pulmonary stenosis and single ventricle, were examined with 40 and 64 MDCT (Philips, Cleveland, OH, USA). Cardiac gated and non-gated, axial contrast-enhanced CT images were acquired, depending upon the age of the child and anatomy of interest.

**Results:** Post-processing of image data was performed on a Philips Brilliance workstation. Axial source images, off-axis 2 dimensional and 3 dimensional reformations were viewed on this workstation and a universal PACS workstation. Post operative exams have confirmed patency of vascular shunts and stents, position and caliber of pulmonary artery bands, and position of ASD, VSD and PDA occluder devices. CT imaging correlates with echo and cardiac cath data in all instances and has shown additional pertinent findings.

**Conclusion:** Cardiac MDCT is an accurate, safe, nearly instantaneous method of examining children with congenital heart disease. Cardiac MDCT can be used to make many primary diagnoses and to follow post-operative changes.

### The Prevalence and Significance of Increased Gastric Wall Radiotracer Uptake in Sestamibi Myocardial Perfusion SPECT

Gholamrezanezhad A, EFTEKARI M, Moinan D, Mirpour S, Hajimohammadi H

**Objective:** Background: Limited available data indicate that a specific pattern of increased gastric wall radiotracer uptake is associated with dyspepsia. Our purpose was to evaluate the frequency of this finding and its relation with dyspeptic evidences.

**Method:** 1056 consecutive outpatients referred for myocardial perfusion SPECT were interviewed concerning the dyspeptic symptoms, current gastric medications and previous gastroduodenal interventions. The intensity of gastric wall activity was graded qualitatively as G1 or hyperactive gastric wall (equivalent to the patient's heart activity) and G2 (less than heart activity).

**Results:** The pattern of gastric wall hyperactivity was identified in 1.9% of patients. Dyspeptic symptoms were present in 80% and 18.6% of G1 and G2 patients, respectively ( $P < 0.001$ ). The dyspeptic symptoms were classified as ulcer-like in 37.5%, dysmotility-like in 43.75% and GERD-like in 18.75% of the dyspeptic G1 patients. Considering the classification of dyspepsia, there was no significant difference between the dyspeptic patients of groups. The history of previous gastroduodenal interventions and current use of gastric medications was significantly higher among G1 patients.

**Conclusion:** The infrequent pattern of gastric wall hyperactivity could be clinically important and can identify a category of patients, who require additional diagnostic gastrointestinal investigation to specify another possible noncardiac origin of complaints.

### Pulmonary Nocardiosis in Post Lung Transplant Recipients – CT Manifestations

SIMMONS P, Mohammed T-LH, Budev M, Gershman A

**Objective:** To describe the CT image manifestations of Nocardia infection (Nocardiosis) in patients who have undergone pulmonary transplantation and to determine if specific imaging features existed for Nocardiosis.

**Materials & Methods:** The authors retrospectively reviewed 473 patients with transplanted lungs at a single lung transplantation center. Single, double and combination heart-lung transplant patients with a documented complication of Nocardiosis and correlating imaging findings were included in this study.

**Results:** Of 141 left lung, 137 right lung, 184 double lung and 11 Heart-Lung recipients, seven patients experienced a post-transplant course complicated by Nocardiosis. Imaging findings consisted of parenchymal consolidations and cavities (which generally involved the upper lobes) as well as multiple pulmonary nodules.

**Conclusion:** The pulmonary manifestations revealed on imaging of Nocardiosis are similar to the results of other multi-center reviews and include multiple, diffuse pulmonary nodules, clustered pulmonary nodules, consolidation and, rarely, cavitation.

### MDCT and MR imaging of Cardiac Neoplasms

AMIN S, Mohammed T-LH, White R, Shoenhagen P

**Objectives:** Review the imaging features of each type of cardiac tumor including the likely age at presentation and the relative prevalence. Describe the MDCT and MR imaging characteristics of the most common cardiac tumors and how to differentiate probably benign processes from malignant processes.

**Methods:** Cardiac neoplasms are quite rare, with an estimated cumulative prevalence of 0.002%–0.3% at autopsy and 0.15% in echocardiographic series. However, if not detected early, they may cause significant morbidity and mortality. Cardiac tumors are usually treatable and can often be diagnosed with echocardiography, computed tomography (CT), or magnetic resonance (MR) imaging.

**Results:** Most primary cardiac tumors are benign. Of these, myxoma is by far the most common, with lipomas and fibromas occurring less frequently. Metastatic involvement of the heart is approximately 40 times more prevalent than primary cardiac tumors. Metastatic spread can be by direct invasion (from adjacent neoplasms such as those of the bronchus and breast), hematologic spread (such as malignant melanoma, lymphoma, or leukemia), or transvenous spread through the great veins (such as renal cell carcinoma or hepatoma). Primary cardiac malignancies are very rare, the majority being sarcomatous in origin. Angiosarcoma is the commonest primary malignancy of adulthood, whereas rhabdomyosarcoma is more prevalent in children.

**Conclusion:** In this poster, the authors present selected images of cardiac masses of various etiologies from our own institution, describe the imaging strategies used in their acquisition, and review the cardiac MDCT and MR imaging characteristics of each tumor type. The cardiac masses discussed include benign tumors, primary malignancies, metastatic involvement, and tumor-like lesions. Familiarity with these imaging features and with the relative effectiveness of these modalities is essential for prompt diagnosis and effective treatment.

### PTLD - Imaging Findings and Histopathologic Correlation

SMITH A, Shah SN, Mohammed T-LH, Chen L

Post-transplant lymphoproliferative disorder (PTLD) is a serious complication of chronic immunosuppression following solid organ and pulmonary transplantation. The frequency of PTLD varies with the type of organ transplant. The higher rate of PTLD in lung transplant and heart-lung transplant recipients, as compared with the frequency of this disease in other solid-organ transplant recipients, is thought to be due in part to the more aggressive immunosuppressive regimen required to prevent lung allograft rejection. Clinical presentation is non-specific. Nearly any organ can be affected. Early diagnosis is associated with a better prognosis but requires tissue sampling to ascertain the histopathological subtype of disease which cannot be predicted by imaging features alone. The radiologist has a key role in detecting this disorder, guiding biopsy and monitoring response to treatment which often involves a reduction in immunosuppressive therapy.

**Objectives:** The objective of our poster is to illustrate the wide spectrum of imaging features of PTLD and correlate these with histopathologic manifestations.

**Methods & Materials:** The authors reviewed the medical records and CT examinations of nearly 470 pulmonary transplantations in adult patients performed between February 1990 and August 2005. At least seven transplant recipients experienced episodes of histologically proven post-transplantation lymphoproliferative disorder. The imaging and pathological features of the disease, the time to diagnosis and the outcomes were assessed.

**Conclusion:** The goals of imaging in patients with PTLD are to detect disease, guide biopsy, and direct appropriate follow-up imaging rather than to establish a specific diagnosis. Because the clinical and imaging manifestations of PTLD are nonspecific and are not reliably predictive of histopathologic subtype, tissue biopsy is necessary for a final diagnosis. The purpose of our poster is to review the clinical features of PTLD in allograft recipients, the wide spectrum of imaging findings and correlate these with the histopathologic findings. Knowledge of the various appearances of PTLD is important because PTLD is an increasing diagnostic dilemma in pulmonary allograft transplant patients, and prompt and appropriate treatment affects outcome.

**Multidetector CT Imaging of Central Airway Neoplasms**

Lee K, Feller-Kopman D, Ernst A, BOISELLE PM

**Objectives:** 1) To illustrate and review the spectrum of benign and malignant primary central airway neoplasms. 2) To highlight the role of advanced CT reconstruction methods including CT bronchography and virtual bronchoscopy in aiding pre-procedural planning and diagnosis.

**Abstract:** Multidetector CT offers a powerful, non-invasive method of assessing endotracheal and endobronchial neoplastic lesions. This exhibit will illustrate and describe the spectrum of benign and malignant primary central airway neoplasms with CT-bronchoscopic correlations. Emphasis will be placed on the use of multiplanar reformations and advanced 3-D reconstruction techniques in aiding diagnosis and pre-procedural planning of central airway neoplasms.

**What Happened to Well's?**

COSTANTINO M, Gosselin M, Brandt M, Spinning K

**Objectives:** The high rate of negative CTA to exclude PE led to a review 630 CTA's performed over 2 years. We were particularly interested in the rate of negative scans performed on women <35, in whom increased radiogenic breast cancer is of concern.

**Methods:** A retrospective chart review of 630 inpatient (45%), ED (42%) and clinic (14%) patients was performed. Rate of positive CTA was 8.9%(8.5% ED, 11.8% inpatient, 1.1% outpatient). Of high, intermediate and low clinical probability patients 2/3(66%), 38/278(14%), and 16/299(5%) had PE respectively. A d-dimer was obtained on 36% of patients (17% <0.5, 47% 0.5-2.0, 36% >2.0). We assume that the ordering physician deemed patients who did not undergo d-dimer testing high probability. Retrospectively assigning clinical probability using Well's criteria we found of 630 patients 3(0.5%), 282(48%) and 300(51%) were high, intermediate and low probability. Seventy-seven (12%) of CTA's were performed on women <35, 3 (3.9%) being positive.

**Results:** Our results suggest that Well's criteria may not be appropriately applied, and clinicians are deeming the majority of patients "high probability" when our data show that very few meet high clinical probability criterion. "High probability" patients are most likely deemed as such because of what has been referred to as a "best clinical guess." Second, given the very low rate of PE in the cohort of women <35 years old, clinicians should ardently seek other explanations for the patients symptoms before ordering the CTA, and the radiation that comes with it, in this cohort.

**Conclusion:** Finally, the high rate of intermediate and positive d-dimer results emphasized the importance of clinical probability. In a truly low probability patient, the clinician may wish to forego the d-dimer and thereby prevent necessary further work-up.

### Cavities in the Lung- Usual, Unusual and New Oncological Etiologies

Trotman-Dickenson B, Hunsaker A, Jacobson FL, (ANURADHA SAOKAR)

**Objectives:** 1. To describe the spectrum of typical causes of cavitating lung masses in a variety of malignancies. 2. To illustrate the imaging appearance of unusual etiologies of cavitating lung lesions. 3. To provide clues for narrowing the differential diagnosis and direct patient management decisions. 4. To demonstrate new causes of pulmonary cavities.

**Methods:** A multitude of lesions cause cavitation in the lung in the oncology cohort. These include tumors, complications related to tumors and their treatment, such as infections. Primary tumors such as squamous cell carcinoma and, less frequently, adenocarcinoma of lung, and metastases from squamous cell primaries and sarcomas cavitate.

**Results:** Oncology patients are vulnerable to infections as they are immunosuppressed to varying degrees during treatment. Cavities are seen during the course of a number of these infections. Timing and accompanying features may effectively differentiate diagnoses. Correlation with galactomannin assay can be an effective correlative tool for monitoring the effect of treatment of Aspergillosis.

**Conclusions:** Cavitation may also relate to treatment, including new therapies such as radiofrequency ablation of lung lesions. Angioinfarction and subsequent necrosis lead to the formation of these and other cavities seen in lungs.

### Spectrum of Complications in Lung Transplant

Jacobson FL, (GILL RR)

**Objectives:**

1. To describe and illustrate a variety of complications in the Lung transplant population.
2. To provide an algorithm for evaluation of immediate postoperative, hyperacute, acute and delayed complications.
3. To provide clues for narrowing the differential diagnosis and direct patient management decisions.
4. To aid in surgical planning pre and post transplant.

**Methods:** Lung transplantation is associated with a great number of major complications that act in concert to limit the long-term success of this difficult treatment option for advanced lung disease. Close and parallel attention to pulmonary and nonpulmonary complications and management of lung transplant recipients are the most important ingredients of optimal long-term outcomes.

We propose to outline the various complications commonly encountered after lung transplantation and aid in the diagnosis and management. We propose to illustrate the problems involved with single versus double lung transplant.

**Results:** Post transplant infections are a major concern, the exhibit will provide clues to narrow the differential diagnosis and help distinguish between infection and rejection.

**Conclusion:** Lastly we illustrate our surgical planning both in pretransplant evaluation and also for post-transplant management, especially in the designing of bronchial stents.

### Cardiopulmonary Findings on CT Pulmonary Angiography in Patients with Suspected Pulmonary Embolus

AMIN SJ, Yadav R, Mohammed T-LH

**Objectives:** Background: Multidetector CT Pulmonary Angiography (CTPA) has become the standard technique utilized to diagnose pulmonary embolus (PE). Current literature has demonstrated that CTPA is excellent for the assessment of other various cardiopulmonary pathologies as well. At The Cleveland Clinic, an 8 month retrospective analysis (January to August 2005) was conducted on all CTPA studies performed on patients for the evaluation of PE. The goal was to identify, catalogue and determine the various cardiopulmonary pathologies resulting in the patient's symptoms.

**Results:** During an eight month period, 1039 cases of suspected pulmonary embolus were evaluated. Pulmonary embolus was found in 11.5% (120/1039) of the cases. Other etiologies detected on CTPA images for the presenting symptoms included: infection 10% (101/1039), pleural effusion 8% (84/1039), emphysema 6.5% (68/1039), metastatic cancer 1.8% (19/1039), fibrosis 1.5% (16/1039), and primary lung cancer 1.1% (11/1039).

### Variability of Contrast Enhancement of the Pulmonary Arteries during 64-slice Coronary CT Angiography

VANOVERMEIRE OM, Duerinckx AJ

**Objectives:** ECG-gated CT angiography of the chest has been proposed as a diagnostic tool to evaluate for pulmonary embolism, aortic disease and coronary disease. We investigated contrast enhancement of the pulmonary arteries during routine coronary CT angiography.

**Material and Methods:** The coronary CT angiograms of 40 consecutive patients (Age =  $55 \pm 11$ , 23 man and 17 women) were retrospectively reviewed. Contrast enhancement in the pulmonary arteries (c-PA) and left upper pulmonary vein (c-PV) were measured at the level of the proximal left superior PV, as well as in the thoracic aorta, using HU. The patients were classified in two groups: group 1 had higher contrast density in the PV than in the PA (c-PA < c-PV) and group 2 had a higher contrast density in the PA than in the PV (c-PA > c-PV). Group 1 was further subdivided based on the contrast density in the PA. The 'pulmonary artery contrast gradient', defined as the change in contrast enhancement from the main pulmonary artery to the left inferior lobar pulmonary artery was measured.

**Results:** In group 1 consisting of 25 patients (62.5%) c-PV =  $376 \text{ HU} \pm 59$ . In this group 7 patients (17.5%) had a c-PA > 300 HU; 12 patients (30%) had  $200 < \text{c-PA} < 300 \text{ HU}$  and 6 patients (15%) had a c-PA < 200 HU. In group 2 consisting of 15 patients (37.5%), c-PV =  $382 \text{ HU} \pm 63$ . 22 patients (88%) in group 1 had a positive pulmonary artery contrast gradient. There was no significant difference in enhancement of the aorta between group 1 and 2 (HU =  $319 \pm 55$  versus HU =  $300 \pm 55$ ).

**Conclusion:** Contrast enhancement of the pulmonary arteries on ECG-gated coronary CT angiogram is highly variable. More research is needed on what enhancement of the lobar pulmonary arteries is needed to be able to rule out peripheral pulmonary embolism.

### Non-Contrast Cardiac CT precisely measures the Sinotubular Junction of the Ascending Aorta: Results from NHLBI's CARDIA Study

JOHNSON D, Brooks M, Wei G, Sidney S, Person S, Carr JJ

**Objective:** Size of the ascending aorta is an important criterion for clinical decision making related to diseases of the aorta and aortic valve. Cardiac CT provides a tool for measuring the ascending aorta, which has not been previously evaluated for clinical practice. We present pilot data on the reproducibility of measurements that can easily be implemented in clinical practice of the aortic size from cardiac CT exams obtained as part of the NHLBI's CARDIA study.

**Methods:** To determine the reproducibility of size measurements a subset of participants from the CARDIA year 20 exam (n=42) were sampled. Participants were excluded if both of the paired cardiac CT exams were not available. Multiplanar reformations at the sinotubular junction were obtained to create an axis perpendicular to the aortic valve. The AP and transverse measures were then averaged to create a mean diameter and statistical analysis performed.

**Results:** Measurement of aortic size from the CT images required <2 minutes of analysis time. The mean diameter and standard deviation(SD) was 28.72mm(3.1) and 28.74mm(3.2) for the first and second scan respectively. The correlation between the paired cardiac CT scans was 0.90(Pearson), adjusted R<sup>2</sup>=0.82. The mean difference between scan pairs was 0.2mm with a 95% confidence interval of -0.41mm to 0.46mm.

**Conclusion:** Cardiac CT exams without contrast can provide reproducible measures of the sinotubular junction of the ascending aorta. The mean aortic diameter can be measured with precision of under 0.5mm. Future work to develop normative standards as well as a better understanding of how aortic size changes over time are planned. These early results suggest that Cardiac CT holds promise as a non-invasive tool to monitor the size of the ascending aorta in clinical practice.

### Free-breathing Non-Contrast VIBE MR-Angiography of the Lung Using ECG Triggering and Respiratory Gating: Image Quality Assessment

ZAPOROZHAN J, Ley S, Fink C, Stemmer A, Puderbach M, Eberhardt R, Gruenig E, Kauczor HU

**Objective:** Aim of this study was to evaluate the feasibility and image quality of a "work in progress" ECG triggered and respiratory gated volume interpolated body examination sequence (VIBE) for non-contrast MR-angiography of the pulmonary arteries.

**Material and Methods:** The whole lung was imaged in 36 subjects (10 volunteers, 26 patients) during quiet respiration on a 1.5 T MR scanner. The sequence was applied in a coronal orientation (TR/TE = 9/3.32 msec; flip angle 8°; 1.3x1.2x2 mm<sup>3</sup>; GRAPPA 2; 88 slices). In each heartbeat, the navigator for respiratory gating is executed after an appropriate trigger delay time, followed by a fat suppression pulse and the data acquisition block. Images were assessed for sharpness and quality of pulmonary arterial branches and thoracic structures and presence of artifacts using a 4-point-score (4-excellent to 1-insufficient/severe artifacts).

**Results:** The mean acquisition time was 10±3 min. 86% of the images were of good to excellent quality with no or minor artifacts. In 8% some parts of the lung were not diagnostic. In 6% the images could not be evaluated due to severe artifacts. The mean score for sharpness of pulmonary arteries was 3.2 and 3.6 for thoracic structures. Overall the image quality was fine, mean score 3.3. Most artifacts were found in the lung parenchyma or close to the diaphragm, overall mean score was 3.6.

**Conclusion:** The new ECG triggered and respiratory gated VIBE sequence was successfully used in 86% of patients during free-breathing with a high image quality and high level of sharpness of vascular and thoracic structures.

**CT Features of Pulmonary Septic Emboli: Comparison between Causative Microorganisms**

JEONG YJ, Kwon WJ, Kim KI, Lee SH

**Objectives:** To describe and compare the CT findings of pulmonary septic emboli between causative microorganisms.

**Materials and Methods:** CT findings of 16 patients (8 male and 8 female, age range; 17-80 years, mean; 53.1 years) with documented pulmonary septic emboli were reviewed retrospectively by two radiologists and decisions on findings were reached by consensus. Statistical analysis was performed using t-test and Chi-Square test.

**Results:** Total 197 peripheral nodules were seen in 6 gram-positive (n=88) and 10 gram-negative (n=109) septic pulmonary emboli patients, respectively. The size of nodules (15.94 mm, range; 3-46 mm) in gram-positive septic emboli were larger than those (12.29 mm, range; 4-44 mm) in gram-negative septic emboli (p=0.006). Cavitation (n= 30[34%] versus n=23[21%], p=0.041) and air-bronchogram (n=12[14%] versus n=4[4%], p=0.008) within nodule were more commonly seen in gram-positive septic emboli. Ground glass attenuation halo around nodule (n=69[63%] versus n=32[36%], p=0.000) and feeding vessel signs (n=56[51%] versus n=25[28%], p=0.001) were more commonly seen in gram-negative septic emboli. Wedge-shaped peripheral lesions abutting the pleura were seen in 4 (67%) and 1 (10%) in gram-positive and gram-negative septic emboli patients, respectively (p=0.047).

**Conclusion:** The detail CT characteristics of peripheral nodules in pulmonary septic emboli could differentiate the causative microorganisms and provide the additional information about the treatment plan in patients with sepsis.

**Iatrogenic Nonthrombotic Pulmonary Embolism: Diagnosis and Significance**

PALACIO DM, Goodman LR, WASHINGTON L, RILLING WS

**Objectives:** To illustrate the multiple causes of iatrogenic nonthrombotic pulmonary embolism and discuss their potential clinical significance.

**Methods:** Chest radiograph and CT findings of the most common sources of immediate and delayed iatrogenic nonthrombotic pulmonary embolism will be displayed.

**Results:** Our collected material demonstrates multiple potential causes of iatrogenic nonthrombotic pulmonary embolism. It includes complications of a variety of procedures performed by interventional radiologists, cardiologists, oncologists, radiotherapists, ICU personnel, and many surgical specialists. Some of the complications are identified immediately after a procedure, while others are observed later. Although the images are often dramatic, the consequences may or may not be important.

**Conclusion:** In order to make clinically important diagnosis, the radiologist must be familiar with the varied imaging appearances of iatrogenic pulmonary emboli and their potential clinical consequences. This information will help clinicians to decide whether no action needs to be taken, or aggressive intervention is required.

### **Repair Through a Keyhole: What Every Radiologist Should Know About Minimally Invasive Cardiac Valve Surgery**

HANDWERKER J, De la Torre R, Spirn P, Gilkeson RC, Hatabu H, Boiselle PM

**Objectives:** Median sternotomy wires are becoming a less common radiographic post-operative finding following cardiac surgery as minimally invasive techniques using radiographically invisible “key-hole” incisions have rapidly evolved in recent years. The goal of this exhibit is to educate radiologists about the role of imaging for minimally invasive cardiac surgical procedures.

**Methods:** Multidetector-row CT (MDCT) and plain film findings will be described and illustrated for pre-operative and post-operative assessment for Minimally Invasive Cardiac Surgery (MICS) patients. A special emphasis will be placed upon patients undergoing a novel approach developed by surgeons at our institution, utilizing a small right axillary incision for mitral valve repair.

**Results:** Portable chest radiographs are the mainstay of postoperative imaging. MICS patients have a different spectrum of postoperative findings and complications compared to patients undergoing traditional sternotomy. Newer imaging techniques, such as MDCT with three dimensional reconstructions, can aid the cardiac surgeon in planning and executing complex minimally invasive procedures.

**Conclusions:** As MICS becomes increasingly common, radiologists should be familiar with these procedures and their associated postoperative radiographic findings.

### **Lung Tumor Measurements: Different Approaches In The Era Of Volumetric CT**

BOGOT NR, Kazerooni EA

**Objectives:** To evaluate different approaches for lung tumor measurements.

**Methods:** Principal information: Measurements of pulmonary nodules are routinely performed by radiologists. These nodules are followed with repeated CT measurements to evaluate their biological behavior. Tumor response to treatment is conventionally assessed by obtaining serial measurements on CT. However, the best way to measure lung nodules is not obvious. Traditionally, unidimensional or bidimensional measurements have been obtained on the single transverse image considered to be the most representative. These measurements are prone to multiple inherent inaccuracies: readers may choose discrepant images to compare measurements; irregular shaped lesions are difficult to measure in a reproducible way; use of different display methods and measuring tools, pen and paper on hard copy versus different computer-based calipers on different soft copy display systems may result in inconsistencies; different studies evaluating inter and intraobserver variability in measurements have shown considerable variation, which may result in significant error when evaluating of change in lesion’s size.

**Results:** Single breath hold volumetric data acquisition with helical CT allows evaluation of the entire nodule consistently. Changes in nodule volume may be found when transverse measurements and visual inspection indicate no change. Automated computer aided volumetric measurements tools may be more reproducible, and less susceptible to human error.

**Conclusion:** Computer aided volumetric measurements tools should be incorporated into clinical practice. Until such systems are in use, we suggest saving images annotated with measurements made to PACS and/or limiting the number of readers doing measurements, when possible.

### Application of the Optical Flow Method to Pre- and Post-contrast MDCT Volumetric Lung Imaging for Assessment of Regional Pulmonary Enhancement – A Feasibility Report

TORIGIAN D, Geftter WB, Affuso J, Dougherty L.

**Objective:** An Optical Flow Method (OFM) can be used for volumetric registration of separate pre- and post-contrast MDCT lung volume data sets despite differences in patient breathholding or patient positioning, and thus for detection and quantitative assessment of regional pulmonary enhancement.

**Methods:** MDCT through the lungs of a patient with multiple occlusive acute pulmonary emboli was performed on a 16-detector row scanner before and after intravenous contrast administration using two separate full-inspiratory breath-hold acquisitions. The two associated thin-section volumetric data sets were then registered using the OFM. Attenuation ratio images were computed to highlight the differences between the aligned volumes. Color scales were subsequently applied to these final data sets.

**Results:** Pre- and post-contrast data sets were correlated to 97% after registration. Pulmonary hypoenhancement in portions of lung corresponding to locations of occlusive acute pulmonary emboli was visually conspicuous on attenuation ratio color map images relative to regions of normal pulmonary enhancement. Attenuation ratios of hypoenhancing portions of lungs ranged from 1 – 1.3, whereas attenuation ratios of normally enhancing portions of lung ranged up to 1.8.

**Conclusions:** The OFM may be used for accurate alignment of volumetric image data sets of separate breath-hold pre- and post-contrast MDCT acquisitions of the lungs, allowing for detection and quantitative assessment of regional pulmonary enhancement.

### A Pictorial Review of CT Findings in Fungal Diseases of the Chest

SMITH EP, Denning DW, Bishop P, Greaves SM

**Objectives:** The aim of this exhibit is to illustrate the spectrum of pulmonary abnormalities in the various classes of fungal infections in immunocompromised patients. The more common appearances will be discussed and atypical features will be highlighted. Pathologic correlation will be provided in specific cases.

**Methods/Results:** Principle Information: Opportunistic fungal infections are a well recognized cause of morbidity and mortality in immunocompromised patients. These diseases are being imaged more frequently partly as a consequence of improved prophylaxis in patients infected with HIV, the increasing use of cytotoxic drugs in patients with haematological & other malignancies and improved immunosuppression in transplant recipients. The type of fungal infection that develops in an immunocompromised patient depends on the nature of the immunosuppression. With neutropenia, opportunistic infections such as Aspergillus, Mucormycosis and Candida predominate. In patients with T-cell defects, fungi such as Cryptococcus neoformans and Histoplasma are more common. Awareness of the various presentations and spectrum of CT findings is important to enable prompt diagnosis and early initiation of surgical and/or antifungal treatment.

**Conclusions:** Opportunistic fungal infections are an important complication of immunosuppression. Radiologists should therefore be familiar with the spectrum of their radiographic findings so as to enable rapid diagnosis and hopefully improve the outcome of these diseases.

### MDCT Analysis of Drainage Patterns of the Pulmonary Veins, and Pulmonary Vein Diameter and Distance to First Bifurcation

CRONIN P, Kelly A, Gross B, Desjardins B, Patel S, Carlos R, Scharf C, Sneider M, Kazerooni E

**Objective:** To establish the normal and anomalous drainage patterns of the pulmonary veins, and the normal values for pulmonary vein diameter, and distance to first bifurcation using MDCT.

**Materials and Methods:** Using MDCT technology, thin-section contrast material-enhanced cardiac CT scans in 200 consecutive patients referred for CT imaging prior to radiofrequency ablation therapy, were retrospectively reviewed. Pulmonary vein anatomy was based on both the number of venous ostia and the drainage patterns. Pulmonary vein diameter and distance to first bifurcation of the four major pulmonary veins plus the middle lobe pulmonary vein (MLPV) were measured by two thoracic radiologists.

**Results:** 82 % had 4 veins. 9% had 5 veins, 4.5 % had 3 veins. 3% had two anomalies, and 0.5% had three anomalies. In 11% the MLPV drained directly into the left atrium. The MLPV drained to the RSPV in 83.5%, and to the RIPV in 5.5%. There was a common trunk in 6.5%. Mean pulmonary vein diameters with 95% confidence interval (CI) at the ostia were: RSPV, 17.6 (17.02–18.23) mm; LSPV, 16.6 (16.03–17.08) mm; RIPV, 17.1 (16.58–17.55) mm; LIPV, 14.8 (14.25–15.27) mm, and MLPV, 8.6 (8.27–8.86) mm. Mean distance to first bifurcation with 95% confidence interval at the ostia were: RSPV, 14.5 (17.02–18.23) mm; LSPV, 17.6 (16.63–18.53) mm; RIPV, 7.0 (6.49–7.46) mm; LIPV, 13.5 (12.83–14.16) mm, and MLPV, 8.4 (7.7–9.17) mm.

**Conclusion:** There is greater variability of the pulmonary venous drainage than previously thought with greater variability of the right-sided venous drainage compared to the left-sided venous drainage. Eighty two percent of people have normal venous drainage. There is significant variance in pulmonary vein diameter, and distance to first bifurcation.

### Clinical experience of Cryosurgery of Lung Cancer, Correlation with Follow Up CT Imaging

HAM S, Oh YW, Kim KT, Kim WY

**Objectives:** Lung cancer is becoming leading cause of death and recently increased the number of cancer related death. In case of metastatic and post op recurred lung malignancy, cryosurgery can be used as a method of palliative treatment for both these endobronchial and extrabronchial presentations. To present our results of CT guided cryosurgery for the primary and metastatic lung cancers and evaluate the role of cryosurgery in the palliation of primary and metastatic lung cancers.

**Materials and Methods:** During last two years, 35 consecutive patients (male:female ratio 29:6) with a mean age of 51.9 years. The ratio of primary and metastatic lung cancer was 24:11. The mean session of cryosurgery is 2.4 treatments per patient. CT guided cryosurgery to carcinoma of the lung was performed.

**Results:** Major symptoms including cough, dyspnea, and hemoptysis were assessed and showed improvement in of symptomatic patients. Patients were followed for a mean period of 11 months (range 4-23months). Cryosurgery provides a safe and effective method for the palliation of advanced lung cancer especially post lobectomy or pneumonectomy patients, and compares favorably with other methods in terms of safety, cost, and complications. In case of metastatic lung cancer, perilesional necrosis prominent in immediate follow up CT scan (within 1 week after cryosurgery). However, follow up CT scan in 2 mo revealed marked improvement (decreased the mass dimension (at least in 20% decrease its diameter).

**Conclusion:** In conclusion, cryosurgery has important role in the palliation of advanced lung, especially post op recurrence or metastatic lesions. Our study suggests that similar palliation may be achieved by cryosurgery applied to advanced lung cancer.

### Spectrum of Imaging Findings in Chronic Pulmonary Embolism

NEWATIA A, Khan A, Shah R

**Objective:** The purpose of this exhibit is to demonstrate the various imaging findings of chronic pulmonary embolism that will aid in clinching the diagnosis.

**Methods:** Principal Information: Chronic pulmonary embolism is a rare but serious sequela of acute pulmonary embolism occurring when pulmonary emboli fail to completely lyse, thus forming an organized clot that can lead to partial vascular occlusion.

**Results:** Pulmonary artery hypertension can result over time, which is associated with considerable morbidity and mortality. Recognition of chronic pulmonary embolism is important and must be differentiated from acute pulmonary embolism since the treatment is surgical rather than anticoagulation therapy. Imaging findings on CT include visualization of an organized thrombus that usually appears as an eccentric or crescentic filling defect. Calcifications can occasionally be present. Chronic pulmonary emboli also have higher HU attenuation values than acute emboli. Other important distinguishing features include dilated pulmonary arteries associated with pulmonary hypertension, asymmetry of the pulmonary vasculature, intercostal artery enlargement from collateral circulation and/or right ventricular enlargement. Finally, a mosaic pattern of attenuation can be seen due to vascular occlusion of the small arteries supplying the secondary pulmonary lobule. This exhibit will demonstrate each of these imaging findings and utilize the aid of multiplanar reformations where appropriate.

**Conclusions:** Chronic pulmonary embolism has several imaging features that can help in its distinction from acute embolism. Recognition of this entity can significantly improve patient outcome since chronic pulmonary embolism is amenable to surgical thrombolectomy.

### Negative Predictive Value of Combined CT Pulmonary Angiography and Indirect CT Venography in ICU

RAVENEL JG, Wallace G, Nguyen S, Schoepf UJ

**Objective:** To evaluate the negative predictive value of combined CT pulmonary angiography and indirect CT venography (CTPA/CTV) in the ICU setting.

**Methods:** We retrospectively reviewed the records of 106 consecutive ICU patients who underwent CTPA/CTV. Radiology reports were examined to determine whether study was positive for PE, PE and DVT, DVT alone, or negative. Studies reported as negative, were further evaluated for evidence of PE or DVT within 30 days by imaging, clinical evaluation, or autopsy data.

**Results:** A total of 27 patients (25.5%) were diagnosed with venous thromboembolism; 21 with PE, 3 with PE and DVT and 3 with DVT. Of the 79 patients read as negative, 1 was determined to have PE and 1 DVT within 30 days of the initial study (NPV=97.5%).

**Conclusion:** A negative CTPA/CTV is reliable for the exclusion of significant venous thromboembolism in ICU patients.

### **Chronic Thromboembolic Pulmonary Arterial Hypertension-Pre and Post-op Imaging Findings with Surgical Correlation - An Educational Exhibit**

SALAHUDEEN SR, Dennie CJ, Seely JE, Matzinger FR, Rubens FD

**Objectives:** Chronic thromboembolic pulmonary arterial hypertension (CTEPH) is thought to be a rare complication of acute pulmonary thromboembolic disease. Because it is one of the only treatable causes of pulmonary hypertension, it is first important to make a correct diagnosis and then to accurately predict surgical resectability.

**Materials and Methods:** The objectives of this educational exhibit are to highlight the imaging findings of CTEPH at pulmonary angiography, helical computed tomographic angiography (CTA), high-resolution CT and cardiac MRI as well as on Gadolinium-enhanced MRA of the pulmonary arteries. In addition to outlining the classic imaging findings of CTEPH, the roles of functional assessment of the right ventricle with MRI and of phase-contrast imaging of the pulmonary arteries will be emphasized in both the pre- and post-operative states.

**Results:** The imaging findings on both CTA and MRI will be correlated with surgical results.

**Conclusion:** Correct diagnosis and knowledge of the functional determination of CTEPH is essential for preoperative planning and postoperative assessment of this treatable cause of pulmonary hypertension.

### **Fibrosing Mediastinitis: Revisited**

MALCOLM I, Singh SP, Watts J

**Objective:** The prognosis of fibrosing mediastinitis remains dismal and carries a high mortality. The course of this disease is unpredictable with spontaneous remissions and exacerbations described. This poster will describe the varied radiologic manifestations of fibrosing mediastinitis; discuss the pitfalls and specific imaging features that allow a meaningful differential and a confident diagnosis.

**Methods:** Review all imaging studies, including chest radiograph, conventional angiograms, CT, MR, and PET in patients with fibrosing mediastinitis over the last 10 years at our institution.

**Results:** Describe the radiologic findings and discuss the differential diagnosis.

**Conclusion:** Imaging plays a vital role in the diagnosis and management of patients with fibrosing mediastinitis and helps in differentiating focal from diffuse variety since the later form has been shown to respond to some degree to steroids. CT and MR imaging are important for assessing extent of mediastinal involvement and for guiding either surgical or percutaneous therapy.

### Left Ventricular Functional Analysis with 16 and 64-row Multidetector CT: Comparison with gated SPECT

AGARWAL PP, Patel S, Kazerooni EA, Jung J, Armstrong W, Barber K, Corbett J, Moscucci M

**Objective:** To evaluate left ventricular function obtained from retrospectively ECG gated 16 and 64 multidetector (MDCT) coronary CT in comparison to similar measurements obtained from gated SPECT imaging.

**Methods & Materials:** 36 patients (25M:11F; age range 40-75 yrs, mean age 58.4) for the study group. All patients underwent both ECG-gated coronary CT angiography and gated SPECT examinations within a 3 month interval, with no interim cardiac events. Left ventricular ejection fraction obtained for both modalities was compared.

**Results:** LV ejection fraction determined with cardiac MDCT correlated well with gated SPECT examination ( $r=0.83$ ). There was no significant difference between the ejection fraction obtained from MDCT (58.86% 14.29) and gated SPECT (61.31% 16.76), using paired t-test ( $p=0.12$ ). CT underestimated ejection fraction by a mean of 2.44% 9.23 compared to SPECT.

**Conclusions:** MDCT with retrospective ECG gating allows for accurate evaluation of left ventricular ejection fraction.

### Multiplanar Imaging of the Axilla

MARTINEZ S, Restrepo CS, Diethelm L, Vargas D, Aponte C

**Objective:** To review the radiologic anatomy of the axilla in multiple planes with examples of morphologic variants and clinical disease.

**Methods:** Principal information: Although the axilla lies between the neck and superior extremity and thus is extrathoracic, it is often included in CT and MRI examinations of the chest. Understanding its anatomy, boundaries, contents and congenital variants is essential for accurate analysis of radiographic findings and appropriate differential diagnosis. We illustrate the anatomy in multiple planes and provide examples of a variety of diseases as well as morphologic variants. Although some elements of the brachial plexus are within the axilla, we have excluded these from our review since the plexus is well described in the neuroradiologic literature.

**Conclusion:** The axilla is a complex anatomical region located between the neck and the superior extremity. Multiplanar capabilities of CT and MR, help the radiologist understand the location and disposition of its anatomic elements. Comprehension of the axillary anatomy is fundamental for identification of congenital variants and disease in this region.

**Diagnosis: Lung Cancer Plan: Determine Resectability**

MARTINEZ S, Restrepo Carlos S, Diethelm L, Ovella Ty

**Objective:** To present the appearance of primary tumor, nodal involvement and metastasis that determine the resectability of bronchogenic carcinoma.

**Method:** Principal information: In 1997 Mountain published his revision of the TNM classification for bronchogenic carcinoma. Surgically resectable lung cancer includes stages IIIa and earlier stages. Stages IIIb and IV are unresectable. Rather than memorizing the definitions for T, N and M by rote, we have found it useful to understand this staging classification for lung cancer in terms of surgical resectability of the tumor including prognostic factors. We assess the size and margins of the primary lesion, categorizing it according to the criteria for stages T1 – 4. For nodes that are enlarged or otherwise appear to be involved with tumor, we categorize them as to resectable (ipsilateral hilar and mediastinal stations) or nonresectable (contralateral mediastinal or distant); involvement of subcarinal nodes does not exclude resection but is a poor prognostic factor.

**Results:** The presence of metastatic disease prohibits surgical cure. However cerebral metastasis presents a special consideration in patients with logistically resectable primary tumor and without other metastatic disease or distant nodal metastases.

**Conclusions:** In assessing the stage of a bronchogenic carcinoma, we categorize the extent of the primary lesion according to its effect on influence of surgical resectability. Similarly, we categorize apparent nodal involvement according to the effect that tumoral spread would have on staging.

**Differentiating Diaphragmatic Paralysis and Eventration with Conventional Chest Radiography**

VERHEY P, Gosselin M, Primack S

**Objective:** Although elevation of the diaphragm can be appreciated on conventional PA and lateral chest radiography, the modality is commonly viewed as inadequate to differentiate diaphragmatic paralysis from eventration. Based on our experience, we believe evaluation of the shape of the elevated diaphragm on PA and lateral chest radiographs, can enable the differentiation of diaphragmatic paralysis and eventration. Our objective was to qualitatively and quantitatively measure the utility of chest radiography in determining the presence or absence of diaphragmatic paralysis in patient's with an elevated diaphragm.

**Methods:** A retrospective analysis of chest radiographs in 35 patients, whom underwent fluoroscopic sniff test for elevated diaphragm, was performed. Diaphragm position and shape for each patient were determined using measurements relating to skeletal structures and radius of curvature, respectively. These results were correlated with the results of the fluoroscopic sniff tests.

**Results:** Of 35 patients with elevated diaphragm on chest radiograph, 14 had diaphragmatic paralysis confirmed with fluoroscopic sniff test. Our results indicate that the radius of curvature or shape of the diaphragm is the most important factor in the presence or absence of diaphragmatic paralysis.

**Conclusion:** Conventional chest radiography is a useful modality for assessment of the functional status of an elevated hemidiaphragm. Based on our results, evaluation of the shape of an elevated diaphragm may preclude the need for fluoroscopic sniff test to determine diaphragmatic paralysis.

### Utility of Clinical Predictor Model for Suspected Acute Pulmonary Embolism in a Cancer Hospital

SROUFE A, Coppage L, Valesco M, Hazelton T

**Objective:** In order to standardize the clinical approach to the determination of pre-test probability in acute pulmonary embolism the Wells scoring system has been proposed. The purpose of this pilot study was to retrospectively determine the utility of the Wells score in a cohort of outpatients in a cancer hospital.

**Methods:** We performed a retrospective analysis of 66 outpatients from our institution who were being evaluated for suspected acute pulmonary embolism and received computed tomography pulmonary angiograms. Pre-test probability was assigned using the previously described scoring system by Wells et al and patients were divided into low, intermediate and high pre-test probability for pulmonary embolism. Our endpoint was the prevalence of pulmonary embolism in each group of pre-test probability.

**Results:** The prevalence for pulmonary embolism in our cohort was 9% (6/66). The prevalence of pulmonary embolism in the low, intermediate and high pre-test probability groups was 3.8% (1/26), 11.8% (4/26) and 16.7% (1/6), respectively. The incidence of pulmonary embolism in the low, intermediate and high pre-test probability groups was 16.7% (1/6), 66.7% (4/6) and 16.7% (1/6), respectively.

**Conclusion:** These preliminary data suggest that application of a pre-test probability model such as the Wells score may be clinically useful in the diagnostic algorithm of acute pulmonary embolism in outpatient cancer patients thus allowing for safe and cost-efficient management of such patients.

### Quantitative Analysis of Airway Abnormalities in Infants and Young Children with Non-cystic Fibrosis Bronchiectasis

BAYRAMOGLU S, Cimilli T, Islim F, Karahasanoglu A, Yirik G

**Objectives:** The purpose of this study was to quantify airway dimensions in infants and young children with non cystic fibrosis (CF) bronchiectasis, and to determine whether the airway structure of this group differs from that of normal children by using high resolution computed tomography (HRCT).

**Methods and Materials:** HRCT images of the lungs were obtained from 26 infants and young children with non-CF bronchiectasis between the ages 0 and 12, and from 15 control subjects in the same ages. On cross-sectional cut airway-artery pairs, airway outer diameter (AOD), airway lumen diameter (ALD), vessel diameter (VD) were measured by two observers. By these measurements airway wall thickness (AWT) was derived ( $AWT = [AOD - ALD] / 2$ ). ALD/VD and AWT/VD ratios were calculated which are markers of bronchiectasis and bronchial wall thickening.

**Results:** Mean AOD, ALD, AWT values and ALD/VD and AWT/VD ratios were greater and VD value was smaller in children with non-CF bronchiectasis than in normal subjects ( $p < 0.001$ ). AWT/VD ratio of nonbronchiectatic segments in children with non-CF bronchiectasis was greater than in control subjects ( $p < 0.001$ ). ALD/VD ratios increased with age in patients and remained constant in control subjects ( $r = 0.22$ ,  $p < 0.001$ ).

**Conclusion:** The airways of infants and young children with non-CF bronchiectasis have thicker walls and are more dilated than those of normal infants and children. The bronchial wall thickening in bronchiectatic but also in non-bronchiectatic airway segments suggests that there may be ongoing airway inflammation and airway remodeling. The increase in ALD/VD ratio with age suggests that these changes are progressive.

### Volumetric Assessment of Pulmonary Metastases Using CAD: Does Reliability Depend on Metastases Size?

PAULS S, Kürschner C, Juchems MS, Schmidt SA, Brambs HJ

**Objectives:** CAD systems are increasingly established in MDR CT diagnostic for example in volumetric assessment of lung nodules. The goal of this prospective study was to evaluate if the reliability of volumetric CAD is dependent on metastases size.

**Material and Method:** 12 patients with known malignant disease and lung metastases received three contrast enhanced MDR CT of the thorax during in the course of tumor staging during chemotherapy. CT protocol was as follows: slice thickness 2 mm, increment 1mm, pitch 0.9, flow 3.5 ml / sec, delay of 25 sec, 120 mAs, and 70 kV (MX 8000 IDT, Philips, Best, NL). Automated volumetric assessment of the lesions and axial measurement was performed using „Lung nodules“ tool (MX View, Philips, NL). All metastases were categorized into three size depending subgroups (<5mm, 5-10mm, 10-15mm, >15mm).

**Results:** 33 metastases were detected overall (size range: 2-22mm; 9mm on average) which featured a mean volumetric size of 557mm<sup>3</sup> (range: 8 – 4268mm<sup>3</sup>). The automatically calculated volumetric growth of the metastases correlated positively and significantly with the manually assessed axial size ( $r=0.733$ ,  $p=0.01$ ) except for metastases <5mm ( $r=0.18$ ). In this subgroup the highest volume reduction in the course of time was reported with CAD (74%) as well as with manual measurement (53%). The maximum gain in size was reported for nodules 5–10mm: 515% with CAD vs. 353% manually. Metastases >10mm gained only 64.3% (CAD) and 52.2% size on average if measurement was assessed manually respectively.

**Conclusion:** Automated, volumetric CAD assessment for detecting lung nodules is reliably possible for lesions >5mm. Further studies have to evaluate if this will have an influence on further treatment.

### Dual Energy Digital Radiography of the Chest: Improved Accuracy in the Evaluation of Calcified Thoracic Pathology

RAFIE N, Gilkeson C, Sachs P, Novak R

**Objectives:** Introduction: Recent progress in digital radiographic techniques has significantly improved our evaluation of cardiothoracic disease. The imaging information made possible with dual energy subtraction technology significantly improves our detection and characterization of thoracic calcification.

**Method:** Dual energy radiography is performed with initial acquisition of a low 60-kVp radiograph. Following a 150 ms delay, the standard 120-kVp image is obtained. Following the application of a post-processing algorithm, standard, subtracted “soft tissue” and “bone” images are presented to the radiologist.

**Results:** The majority of the published literature on dual energy subtraction has focused on the improved detection of lung nodules. We have found that dual energy radiography particularly expands the accurate characterization of a wide variety of cardiothoracic calcification: Dual energy subtraction can enable diagnosis of the benign calcified nodule. While the technology also improves delineation of the pulmonary nodule from underlying bony pathology, dual energy improves detection of asbestos related plaques, sensitivity of skeletal metastasis, coronary artery and valvular calcification.

**Conclusion:** This exhibit will demonstrate the significant diagnostic role dual energy in characterization of the calcified thoracic lesion.

### Value of 16-slice CT to Detect Significant Obstructive Coronary Artery Disease – Comparison with Catheter Coronary Angiography

CHARTRAND-LEFEBVRE C, Bordeleau E, Lamonde A, Belblidia A, Coté G, Lespérance J, Soulez G

**Objectives:** Noninvasive MSCT coronary angiography is an imaging technique in rapid evolution. This study was designed to retrospectively evaluate the diagnostic performance of 16-slice CT coronary angiography for the detection of significant coronary lesions.

**Methods:** Sixteen-slice CT coronary angiography (16 x 0,625 mm, rotation 500 ms, retrospective EKG gating) was performed in 26 patients (18 men, mean age 65) with risk factors for coronary artery disease. Mean heart rate was 59 bpm (42- 77). Fifty-three percent of patients received pre-scan oral beta-blockers. The diagnostic performance of CT for detection of significant lesions (> 50% diameter reduction) in assessable coronary segments was compared with that of catheter coronary angiography.

**Results:** The sensitivity of CT angiography for detection of significant lesions was 80%; specificity 100%; positive predictive value 100%, and negative predictive value 98,5%, for 210 assessable segments. Non assessable rate was 26 % (73 segments), mostly because of stepladder artifacts and coronary calcifications. Mean coronary calcium score was 483 (9 – 1217).

**Conclusions:** CT coronary angiography permits excellent prediction of the absence of significant obstructive coronary artery disease, when performed in optimal conditions. Sixteen-slice CT with 500 msec rotation however is hampered by a relatively low robustness, since 26 % of coronary segments were judged non optimal or associated with artifacts.

### Coronary CT Angiography: Systematic Review of the Literature

CHARTRAND-LEFEBVRE C, Cadrin-Chênevert A, Bordeleau E, Ugolini P, Prenovault J, Ouellet R, Sablayrolles J-L

**Objective:** MDCT imaging of the coronary arteries with ECG-gating is a fast-growing technology. The aim of this poster is to present an overview of the technical capabilities of coronary CT angiography with 16-slices scanners and 64-slices scanner and to present a review of the literature.

**Methods:** Evaluation of coronary artery stenoses with 16-slices CT in comparison to invasive angiography have shown mean sensitivities and specificities of 89.5 % and 95.4 %. A remarkable trend was the high negative predictive value (NPV) of coronary CTA for the detection of significant stenoses (98.0 %). A small number of published studies with 64-slices CT have confirmed these very good results. Limiting factors remains the presence of severe calcifications and rapid heart rates. Potential indications of coronary CTA for lumen evaluation can be in conditions where the benefit /cost ratio of doing catheter angiography is low, especially with the high NPV confirmed in multiple studies.

**Results:** Coronary CTA enables not only coronary lumen evaluation but also coronary atherosclerotic plaque visualization. Grafts and anastomoses stenoses evaluation is still hampered by the same relative limitations than the evaluation of native coronary arteries. Graft patency evaluation however is highly accurate with MDCT, with potential application in recent postoperative status. Coronary stents occlusion is possible with ECG-gated MDCT. Evaluation of in-stent stenoses is more limited, mostly because of the artefacts caused by stent material.

**Conclusion:** Finally, for coronary artery congenital anomalies, CTA can describe the origin and the course of the aberrant vessels and may become the method of choice to evaluate congenital coronary anomalies.