Society of Thoracic Radiology
Oral Presentations
Scientific Session I – Cardiac
Sunday, February 28, 2010

Moderators: Drs. S. Patel and S. Bhalla

1 7:20 AM University of Alabama at Birmingham, Evaluation of Pulmonary Artery Distensibility and Diastolic Right Ventricular Outflow Tract Wall Thickness Measurement as Tools in Assessment of Pulmonary Arterial Hypertension, SINGH S, Malkov DY, Tallaj J, Nath H
Satinder Singh, MD

2 7:30 AM Albert Einstein College of Medicine, Montefiore Medical Center, Chest Radiographs are Valuable in Demonstrating Clinically Significant Pacemaker Complications, Delvin D, Jain VR, Godelman A, HIRSCHL D, Gross JN, Stein MW, Haramati LB
David Hirschl, MD

3 7:40 AM Winthrop-University Hospital, Frequency of Ductus Arteriosus Remnants on Routine Multi-detector Thoracic CT, GIDWANEY R, Shah RA, Katz DS
Rita Gidwane, MD

4 7:50 AM Cleveland Clinic Foundation, Prevalence of Incidental Extra Cardiac Findings Detected in Topogram Images from Coronary CTA Examinations Otherwise Excluded in the Axial Data Set, SHARMA N, Koplas M, Mohammed T-L, Kirsch J
Nidhi Sharma, MD

5 8:00 AM University of Wisconsin-Madison, Meta Analysis of 64 Slice Coronary CTA for the Detection of Coronary Stenosis >50%, SCHIEBLER M, Chen Y, Francois C, Reeder S
Mark Schiebler, MD

6 8:10 AM University of New Mexico, Accuracy of Non-gated Chest CT for the Detection of Left Atrial and Left Ventricular Enlargement, HUCKLEBERRY J, Haltom S, Issac T, Gabaldon J, Ketai L
Jason Huckleberry, MD
Evaluation of Pulmonary Artery Distensibility and Diastolic Right Ventricular Outflow Tract Wall Thickness Measurement as Tools in Assessment of Pulmonary Arterial Hypertension

SINGH S, Malkov DY, Tallaj J, Nath H

Purpose: To evaluate the correlation between main(MPA), right(RPA) and left pulmonary artery (LPA) distensibility and diastolic right ventricular outflow tract wall thickness (RVOT) for pulmonary arterial hypertension (PHT), measured on gated 64 detector MDCT.

Methods: We retrospectively selected all patients who had undergone gated cardiac CT for reasons other than PHT (group A, 25 patients) and those with PHT (group B, 40 patients). Images from all 10 phases were postprocessed on thin client Tera recon workstation. Pulmonary artery segments distensibility and diastolic RVOT wall thickness were measured in all 65 patients. Mean values were compared between groups. In group B correlation between the CT metrics data and right heart catheterization data as well as clinical assessment of disease severity was evaluated.

Results: Mean MPA distensibility was 11.8% and 9.12% in groups A and B respectively (p= 0.148). Mean RPA distensibility was 16.6% (group A) and 11.1% (group B) (p= 0.005). Mean LPA distensibility was 13.1% (group A) and 8.52% (group B) (p= 0.012). Mean diastolic RVOT wall thickness was 3.239 mm (group A) and 4.980 mm (group B) (p <0.001). Correlation analysis: diastolic RVOT wall thickness with mean pulmonary artery pressure (mPAP) (r=0.633), pulmonary vascular resistance (PVR) (r=0.224) and PHT severity (r=0.484). MPA distensibility measurements showed weaker correlation with mPAP and disease severity (-0.366, -0.389, respectively) and stronger correlation with PVR (r= -0.42).

Conclusion: RPA and LPA distensibility is significantly decreased and diastolic RVOT wall thickness significantly increased in patients with PHT. Diastolic RVOT wall thickness strongly correlates with mPAP.

Chest Radiographs are Valuable in Demonstrating Clinically Significant Pacemaker Complications

Delvin D, Jain VR, Godelman A, HIRSCHL D, Gross JN, Stein MW, Haramati LB

Purpose: The role of chest radiography (CXR) in demonstrating clinically important abnormalities after pacemaker implantation is unclear. This case-controlled study evaluates the utility of CXR in demonstrating abnormalities that required reoperation.

Methods: We retrospectively identified 14 consecutive patients who required pacemaker reoperation 5/05-6/08 and who had available CXR (6 men, 8 women, mean age 71). 10 pacemakers were implanted at our institution, 4 were referred for reoperation. 42 controls had normal device function (25 men, 17 women, mean age 76). All post-operative CXR were blindly reviewed by at least 2 of 4 radiologists for lead perforation and position of right atrial and ventricular leads. Follow-up CXR were assessed for lead perforation, displacement, and fracture. CTs, when available, were reviewed for lead placement and perforation. Data were analyzed using Fisher’s exact test.

Results: 1.7% (10/581) patients required reoperation for pacemaker dysfunction (non-capture, mal-sensing, unacceptable impedance), extra-cardiac stimulation, and lead perforation/displacement. There were no lead fractures. CXR demonstrated pacemaker complications in 57% (8/14) of patients at a median of 2 (<1-32) days after implant and in 5% (2/42) of controls (p<0.0001). None of the abnormalities were noted on the official reports. Among subgroups, CXR were abnormal for: pacemaker dysfunction 57% (4/7) cases vs 0% (0/21) controls (p=0.0017), extra-cardiac stimulation 33% (1/3) cases vs 0% (0/9) controls (p=0.25), and lead perforation/displacement 75% (3/4) cases vs 17% (2/12) controls (p=0.06).

Conclusion: CXR are useful after pacemaker placement and demonstrate the majority of complications requiring reoperation. Familiarity with the expected normal position of the leads, appearances of complications and comparison with prior CXR is crucial in rendering a correct diagnosis that guides patient management.
Frequency of Ductus Arteriosus Remnants on Routine Multi-detector Thoracic CT

**GIDWANEY R, Shah RA, Katz DS**

**Purpose:** To determine the frequency with which remnants of the ductus arteriosus (DAR) can be visualized on routine multi-detector CT of the thorax.

**Methods:** We prospectively evaluated 516 sequential adult & pediatric CT examinations of the thorax (391 enhanced & 125 non-enhanced) performed at our institution for the presence of either a calcified DAR (ligamentum arteriosum calcification) or a non-calcified DAR (with or without identifiable flow). All examinations were performed on a 16-detector or greater CT scanner & imaged at either 1 or 3 mm slice thickness.

**Results:** Mean patient age was 57 years (range 1-102), with 276 females (53%) & 240 males (47%). The overall frequency with which a DAR was visualized was 27.5%. 58% of these remnants were calcified, & 42% were non-calcified. Non-calcified remnants were seen as a very thin vascular channel, usually containing contrast when IV contrast was given, between the aortic arch & left pulmonary artery. There was a slightly greater frequency in females, with an overall incidence of 29.8% in females & 24.2% in males. Calcified DAR were seen with greater frequency on non-enhanced CT compared to enhanced CT (21.6% versus 14.3%). The presence of IV contrast did not appear to affect the frequency with which non-calcified ductal remnants were seen.

**Conclusion:** Remnants of the ductus arteriosus are a frequently visualized incidental finding on both enhanced & non-enhanced thoracic MDCT. The high incidence of these findings on routine CT likely reflects the increased spatial resolution of MDCT. Radiologists should be aware of their high prevalence on routine CT to avoid confusing them with either a pathologic process, such as aortic injury in trauma patients or thoracic aortic atherosclerotic disease.

Prevalence of Incidental Extra Cardiac Findings Detected in Topogram Images from Coronary CTA Examinations Otherwise Excluded in the Axial Data Set

**SHARMA N, Koplas M, Mohammed TL, Kirsch J**

**Purpose:** MDCT scanners allow the detection of coronary lesions with good sensitivity and specificity. Images in the axial plane are obtained limited to include the heart, and exclude a significant portion of the chest such as the lung apices and costophrenic angles. The purpose of this study was to retrospectively assess the prevalence of extra cardiac findings in these excluded regions on topogram images in a population undergoing CTA of the coronary arteries.

**Methods:** Data for 776 consecutive patients referred for coronary CTA was evaluated. Patients with prior CABG, cardiac transplantation, coronary reimplantation and unavailable topograms were excluded from the study. Images were analyzed and the extra cardiac findings were grouped into major and minor categories. Data was correlated with demographic data and risk factors.

**Results:** 656 patients were included (age mean 53.3 years, SD 13.4 years, M:F 392:264). There were 22 major findings (17 pulmonary nodules and 5 pneumonias) in 19 patients (2.9%). The minor findings were pleural effusions (27), emphysema (8), granulomas (6), parenchymal scar (11), fibrosis (7), and aortic atherosclerosis (15), tortuosity (31) and aneurysm (13). Also scoliosis (9), fractures (2), and mediastinal adenopathy (2) were found. Important clinical data include 74 patients with known cancer (30 skin, 13 breast cancer, 31 other). Review of the 17 nodules revealed only 1 patient to have a history of known malignancy. 109 patients (16.6%) are current smokers.

**Conclusions:** Topograms are a useful tool in evaluating extra cardiac findings due to an enlarged field of view and should be incorporated in the routine evaluation of coronary CTA exams.
Meta Analysis of 64 Slice Coronary CTA for the Detection of Coronary Stenosis >50%

SCHIEBLER M, Chen Y, Francois C, Reeder S

Purpose: Meta analysis of the Accuracy of coronary CTA for the detection of coronary artery stenoses.

Methods: Literature search ending in April of 2009 was performed for all publications reporting the use of 64-slice coronary artery CTA (cCTA) for the determination of coronary artery stenosis of 50% and/or 75% using coronary angiographic confirmation. Collation of all studies prior to cut off date found a total of 55 publications that met these criteria. The mean and standard deviation of the summed sensitivity and specificity values of all these studies for the determination of both 50% and 70% coronary artery stenosis was performed.

Results: 55 publications met the inclusion criteria with 5,392 total patients studied. There were a total of 51/55 publications that reported on stenoses of 50%. There were a total of 43,720/53,081 coronary artery segments assessed. The sensitivity for cCTA detection of 50% stenosis was 88.77 (+/- S.D. 10.79); specificity was 92.35 (+/- S.D 9.77). There were 7/55 publications that reported on coronary artery stenoses of 75%; sensitivity 81.47 (+/-S.D. 8.25) and specificity of 95.82 (+/- S.D. 2.27). There were 17/55 publications that reported mean Agatson calcium score; average calcium score 382.34 (+/-S.D. 260). There was no significant correlation between high calcium scores or increased fraction of upgradeable segments and decreased sensitivity or specificity.

Conclusion: Published data on the performance of cCTA for the detection of coronary artery stenosis shows better sensitivity and specificity for the detection of 50% stenosis than 75% stenosis. Surprisingly, there was no correlation between higher average calcium scores and decreased test performance.

Accuracy of Non-gated Chest CT for the Detection of Left Atrial and Left Ventricular Enlargement

HUCKLEBERRY J, Halton S, Issac T, Gabaldon J, Ketai L

Introduction: Due to averaging of diastolic and systolic volumes non-gated chest CT images are expected to be specific but not sensitive for detection of left ventricular enlargement (LVE) or left atrial enlargement (LAE).

Methods: Two independent reviewers evaluated images from 100 subjects who had received CT angiography within 48 hours of undergoing transthoracic echocardiography (TTE). While blinded to TTE results, reviewers measured maximal left atrial diameter (LAD) and left ventricular diameter (LVD) on axial images and 3-chamber view reconstructions. TTE results were used as ground truth and considered binary, either positive or negative for LVE or LAE. Cardiac-gated CT criteria for the upper limits of LAD and LVD were used to calculate sensitivity and specificity of non-gated CT measurements. Overall accuracy of non-gated CT measurements of LAD and LVD in detecting LAE and LVE were assessed by the construction ROCs and measurement of area under the curve (AUC).

Results: Non-gated axial CT images were 64% sensitive and 91% specific for the detection of LAE when a cut off of 4.5 cm was used as the upper limit of normal LAD. CT images were 42% sensitive and 92% specific for detection of LVE when a cut off of 5.5 cm was used for the upper limit of normal LVD. The AUC of the ROC for detection of LAE was 0.88 when axial images were used and 0.85 when LAD was measured on 3-chamber views. The AUC of the ROC for detection of LVE was 0.82 on axial images and 0.76 when LVD was measured on 3-chamber views.

Conclusion: Non-gated CT angiography is specific but not sensitive for the detection of LVE or LAE. Accuracy for detection of LAE is greater than LVE, but neither the accuracy of detecting LAE or LVE is improved by the use of multiplanar reconstructions.