

**Society of Thoracic Radiology
Oral Presentations
Scientific Session III
Wednesday, March 5, 2008**

Moderators: Drs. P. Maldjian and J. Fishman

- 15 7:00 AM Washington University, **MDCT of Partial Anomalous Pulmonary Venous Return in Adults**, HO ML, Bhalla S, Gutierrez FR
Mai-Lan Ho

- 16 7:08 AM Saint-Luc Hospital- University of Montreal Hospital Center, **Evaluation of the Reliability of a Pulmonary Nodule Volumetry Software with a Thoracic Anthropomorphic Phantom**, PASIAN SG, Hoang D, Samson L, Cordeau MP, Chalaoui J, Pakkal M, Chartrand-Lefebvre C
Sergio Giuntini Pasian, MD

- 17 7:16 AM University of Iowa Hospitals and Clinics, **Chest X-ray CAD System: Clinical Experience in Cancer Follow-up Patients**, LAROIA AT, Thompson B, Mullan B, Stanford W, van Beek EJR
Archana Laroia, MD

- 18 7:24 AM Winthrop-University Hospital, **Utilization and Yield of Imaging Examinations for Suspected Pulmonary Embolism: Trends over a Ten-Year Period at One Tertiary-Care Hospital**, Hurewitz AN, Groth ML, Kim J, KATZ DS
Douglas S. Katz, MD

- 19 7:32 AM University of Michigan, **The Added Value of Multiplanar CT Image Review in the Evaluation of Pulmonary Embolism: A Retrospective Interobserver Study**, ESPINOSA L, Kelly A, Neal C, Inampudi R, Chughtai C, Agarwal P, Kazerooni E
Leandro Espinosa, MD

- 20 7:40 AM Royal Brompton Hospital, **CT Predictors of Pulmonary Hypertension: Are Signs Valid in Fibrotic Lung Disease?**, DEVARAJ A, Wells AU, Meister M, Wort J, Corte T, Hansell DM
A. Devaraj, MBBS

- 21 7:48 AM Medical University of South Carolina, **Biomarker Correlation with Cardiovascular CT Data**, RUZSICS B, Suranyi P, Abro J, Brothers R, Parker A, Nguyen S, Costello P, Schoepf UJ
Balazs Ruzsics, MD, PhD

MDCT of Partial Anomalous Pulmonary Venous Return in Adults

HO ML, Bhalla S, Gutierrez FR

INTRODUCTION.

The purpose of this study was to describe the lobar distribution and anatomic findings of partial anomalous pulmonary venous return (PAPVR) in the adult population, using multidetector computed tomography (MDCT).

MATERIALS AND METHODS.

Adults (age > 18 years) diagnosed with PAPVR were retrospectively identified from review of 102,074 chest CT cases read at our institution over an 8-year period. The study group consisted of 52 adults diagnosed with PAPVR on chest CT.

RESULTS.

Prevalence of PAPVR was 0.05% (52 of 104,000). Mean age was 57.3 years., and there was a 65% female predominance. Incidences of anomalous vein location by lobe were 58% left upper lobe (LUL), 38% right upper lobe (RUL), 15% right lower lobe (RLL), and 2% left lower lobe (LLL). Among cases of RUL PAPVR, 45% were associated with sinus venosus ASD (SVASD). Anomalous drainage from the right upper lobe involved two veins in 67% and one vein in 33% of cases with SVASD, while all cases of RUL PAPVR without SVASD involved a single superior pulmonary vein. SVASD was not seen in conjunction with anomalous return from any other lobe. Clinical symptoms and electrocardiographic findings were nonspecific, and surgery was not required in most patients.

DISCUSSION.

Calculated prevalence was far below the 0.4-0.7% estimated by autopsy studies and the 0.2% reported in prior literature. RUL PAPVR frequency and SVASD association were much higher than previously reported. This divergence from prior literature may be due to differences in study population (adult vs. pediatric), as well as improvements in cross-sectional imaging enabling better detection of PAPVR in the right upper lobe.

Evaluation of the Reliability of a Pulmonary Nodule Volumetry Software with a Thoracic Anthropomorphic Phantom

PASIAN SG, Hoang D, Samson L, Cordeau MP, Chalaoui J, Pakkal M, Chartrand-Lefebvre C

Introduction: Verify the reliability of the software LungCare (Siemens) in the volumetric measurement of synthetic nodules in a thoracic anthropomorphic phantom.

Method and Materials : utilization of a thoracic anthropomorphic phantom containing 80 nodules of different diameters (3, 5, 8, 10, 15 and 20mm), solid and semi-solid (-800, -630, +50 and +100 HU), regular and irregular shape, placed on variable localisation (within the parenchyma, sub-pleural, juxtavascular and paramediastinal). Images were obtained on a MDCT 16-slices, 0.75mm slice thickness, at regular dose (180mAs) and low-dose (40 mAs), both at 120Kv. The segmentation and the nodules' measurement were performed with the LungCare software. The nodules volumes were compared to the real volume of each nodule with statistic analysis for each category.

Results : For all measurements a 2mm image reconstruction was used, as proposed by the software manufacturer. For 10mm and 20mm solid nodules (+50 and +100UH), a maximum measurement error variation of 7.7% was observed, rising to 23.3% for those smaller than 10mm, independent of shape, localisation or irradiation dose. For semi-solid nodules (-630 and -800UH), the measurement variation error was 8.6% for 20mm nodules and 23.7% for the 8mm ones, rising at low-dose scanning up to 30%; failure of recognition by the system occurred when they were 3mm and 5mm, and for the juxtavascular localisation (8mm) as well.

Conclusion: The accuracy of the automatic volume measurement remains acceptable for supracentimetric nodules independent of the density, shape, localisation and exposing dose. However, measurement of infracentimetric nodules is less accurate, especially for semi-solid nodules with an irregular shape and/or adjacent to a vessel, and at low-dose scanning.

Chest X-ray CAD System: Clinical Experience in Cancer Follow-up Patients.

LAROIA AT, Thompson B, Mullan B, Stanford W, van Beek EJR.

Purpose: To assess the performance of a real-time interactive pulmonary nodule analysis system for evaluating chest Digital Radiograph (DR) images in a routine clinical environment.

Materials and methods: A real-time interactive pulmonary nodule analysis system for chest digital radiographic image softcopy reading (IQQA-Chest, EDDA Technology, Inc.) was used in daily practice with PACS in a large cancer institute. Patients referred for follow-up of known cancer underwent digital chest radiography. PA and lateral DR were first read by resident radiologists and experienced chest radiologists using routine PACS viewing stations. The software system was subsequently applied to the PA DR, and changes in diagnosis were recorded. For reference standard, a follow-up chest radiograph at least 6 months post initial films or a follow-up CT of the chest within 3 months were accepted to decide on diagnostic accuracy.

Results: Of 324 DR examinations performed, follow-up imaging data according to our parameters were available in 214 (67%). Lung nodules were confirmed in 35 patients without the software, while this increased to 51 patients with use of the software (sensitivity increase from 63.8% to 92.7%). Nodules were subsequently proven to be malignant in 5 of the extra 16 cases (31%). False positive increased from three to six cases (specificity decrease from 98.1% to 96.2%). A total of 153 true negative cases were seen (71.4%).

Conclusions: This study suggests that the interpretation of chest radiographs for follow-up of known malignancy can be improved using an automated nodule detection system. This increased detection comes at a minimal cost in terms of false positives, when combined with the radiologist read.

Utilization and Yield of Imaging Examinations for Suspected Pulmonary Embolism: Trends over a Ten-Year Period at One Tertiary-Care Hospital

Hurewitz AN, Groth ML, Kim J, KATZ DS

Introduction: A retrospective examination of all patients undergoing either CTPA or ventilation/perfusion (V/Q) scans over the past ten years was performed, accumulating data only for the month of January for each year, to determine whether the transition from V/Q to CTPA resulted in more diagnoses of pulmonary embolism (PE).

Methods/Materials: Demographic and radiographic data from all patients undergoing either CTPA/CT venography (CTV) or lung perfusion scanning at a single tertiary care hospital from Jan. 1998 through Jan. 2007 were retrospectively analyzed. The radiology log books were reviewed to extract the patient information sets for each month of Jan., and the official reports of the CTPA/CTV and V/Q scans were also reviewed. The number of examinations performed during each month of Jan. & the yield of positive PE diagnosis was then compared over the ten-year period.

Results: The number of CTPA exams increased from 15 to 138/mo., whereas the number of V/Q scans fell from 74 to 7/mo. The total number of PE diagnosed using either imaging test progressively increased, and was twice as many in Jan. 2007, with 20/mo., compared with Jan. 1998, with 10/mo. During this same time interval, the diagnostic yield of CTPA remained relatively constant, at 11% +/- 1 (mean +/- SEM; range 7-18%).

Conclusions: Over the past 10 years, we observed a trend to increased testing for suspected PE, primarily as a consequence of increased requests for CTPA/CTV. Currently the number of positive cases of PE detected doubled when compared with ten years earlier. Most likely, a combination of increased clinical suspicion plus the ready availability and enhanced quality of multi-detector CT scanners has resulted in improved clinical detection of PE.

The Added Value of Multiplanar CT Image Review in the Evaluation of Pulmonary Embolism: A Retrospective Interobserver Study

ESPINOSA L, Kelly A, Neal C, Inampudi R, Chughtai C, Agarwal P, Kazerooni E.

Purpose: To determine the added value of multiplanar viewing of CT pulmonary angiography (CTPA) on diagnostic confidence and interpretation time for suspected pulmonary embolism (PE) among cardiothoracic radiology faculty and diagnostic radiology residents.

Methods: 50 consecutive CTPA examinations were performed using a 64 detector CT scanner at 1.25 mm collimation, 0.625 mm reconstruction interval, 0.6s gantry rotation time, and non-ionic contrast injected at 4 cc/second using bolus tracking. Three radiologists and three radiology residents, blinded to clinical reports and each others readings, reviewed each case alone using only an axial display mode, and at a separate later session using multiplanar reformatting (MPR) on an AW workstation. Readers scored for PE using a 5 point scale, from definitely (+) to definitely (-), rated their diagnostic confidence on a 3 point scale, and recorded their interpretation time.

Results: Interobserver agreement between faculty was fair to good using axial viewing (weighted kappa, $K = 0.4085$ to 0.6449) and good using MPR viewing ($K = 0.6039$ to 0.7240). Interobserver agreement between residents was fair using axial viewing ($K = 0.2645$ to 0.4868) and fair to good using MPR ($K = 0.3912$ to 0.6367). Reader confidence was improved among all readers with MPR viewing, but did not reach statistical significance (McNemar test). Interpretation time with MPR was significantly longer for two of three faculty ($p < 0.001$) and significantly shorter for two of three residents ($p < 0.001$).

Conclusions: MPR viewing increased agreement, confidence and viewing time among cardiothoracic radiologists over axial viewing alone. Among residents, MPR viewing improved reader agreement, confidence and may reduce interpretation time.

CT Predictors of Pulmonary Hypertension: Are Signs Valid in Fibrotic Lung Disease?

DEVARAJA, Wells AU, Meister M, Wort J, Corte T, Hansell DM.

Introduction: This study aimed to evaluate the validity of pulmonary artery signs on multi-detector CT (MDCT) of pulmonary hypertension in patients with fibrotic lung disease.

Methods/materials: Sixty-two patients (30 males, mean age 56.4 years) who had undergone both thoracic MDCT and right heart catheterisation were evaluated. The population consisted of two groups: the first group comprised 33 patients with fibrotic lung disease (FLD), the second a group of 29 patients with a variety of pulmonary vascular diseases (PVD) (including 16 with idiopathic pulmonary arterial hypertension). Dimensions of the main pulmonary artery, segmental, sub-segmental and sub-sub-segmental arteries were measured at predetermined levels. Correlations were made between absolute measurements and mean pulmonary artery pressure (mPAP) in the two groups.

Results: Compared to good correlations between main pulmonary artery diameter and mPAP in patients with PVD ($r = 0.51$, $p < 0.005$), there was no such correlation in patients with FLD ($r = 0.23$, $p = 0.18$). In FLD mean segmental artery size provided the best individual correlate with mPAP ($r = 0.61$, $p < 0.001$); this correlation was less strong in the PVD group ($r = 0.45$, $p = 0.03$). No relationship between the sub-segmental and sub-sub-segmental arteries and mPAP existed in either group.

Conclusion: The widely used sign of main pulmonary artery dilatation is not a reliable marker of pulmonary hypertension in patients with FLD. The mean segmental artery size may provide a better indication of mPAP in patients with FLD.

Biomarker correlation with Cardiovascular CT Data

RUZSICS B, Pal Suranyi, Joseph Abro, Robin Brothers, Adrian Parker, Shaun Nguyen, Philip Costello, U. Joseph Schoepf

Purpose: In primary prevention, risk factors are valuable in the determination of who could have higher chance of cardiovascular events. In this study different biomarkers were screened and results were correlated with high quality dual source CT image data in order to find optimal biomarkers for predicting cardiac pathology.

Methods: A 4cc plasma sample was collected in a chilled EDTA tube, centrifuged, and the plasma decanted into 0.5mL aliquots with the correct identifier information on each tube. The plasma was stored at -70degC. A cytokine and protease profiling panel was performed using the multiplex approach.

Results: Fifty patients (n=50) participated in the present study. We focused on six biomarkers including IL6, IL8, MMP2, MMP3, MMP7 and MMP8. We found statistically significant correlations between IL6 and MMP2 vs. cardiac output ($p<0.05$). The regression analysis in both biomarkers revealed a higher level of IL6 and MMP2 represents better myocardial performance i.e. higher cardiac output. Vessel involvement also yielded significant correlation with the level of IL8 and MMP3 ($p<0.05$). If there are high levels of IL8 and MMP3 biomarkers the chance of multi-vessel coronary disease is significant. Moreover, MMP3 levels were significantly higher in patients with significant coronary stenosis, diagnosed by coronary CT angiography.

Conclusion: To screen IL 6 and MMP2 in patients with ischemic coronary disease may assess the quality of myocardial function. Monitoring IL8 and MMP3 may have the future potential to predict coronary artery involvement in ischemic heart disease.