Society of Thoracic Radiology
Oral Presentations
Scientific Session III
Tuesday, March 17, 2015

Moderators: Brett W. Carter, MD and Amita Sharma, MD

11 7:00 AM  Communication of Chest Radiography Results Using a Cloud-based Video Reporting System
Jason D. Balkman, MD
BALKMAN JD, Cooke TL and Cooke ES

12 7:10 AM  Weight Based Thresholds to Reduce Radiation Dose in Diagnostic 64 Slice MDCT of the Thorax
Alexander Kessler, MD
KESSLER A, Chaturvedi A and Hobbs SK

13 7:20 AM  Effectiveness of MR Angiography for the Evaluation of Acute Pulmonary Embolism
Anthony Jedd, MD
JEDD A, Oliva I, Kalb B, Petkovska I, Martin D, Sharma P and Urbina S

14 7:30 AM  Improving Quality of Computed Tomographic Pulmonary Angiography (CTPA)
Kevin Michael Kuppler, MD
KUPPLER KM, Prather A, Rojas C and Nallamshetty L

15 7:40 AM  Normal Thymus in Adults: Appearance on CT and Associations with Age, Sex, BMI and Smoking
Tetsuro Araki, MD
ARAKI T, Nishino M, Gao W, Dupuis J, O’Connor GT and Hatabu H
Communication of Chest Radiography Results Using a Cloud-based Video Reporting System

BALKMAN JD, Cooke TL and Cooke ES

Objective: Chest radiologists have traditionally played an active role in clinical decision-making and education during radiology rounds. With in-person consultations declining, this work evaluates video reporting as an alternative for chest radiologists to interact with primary teams and thus participate more directly in patient care.

Methods: An Institutional Review Board exemption was obtained. Anonymized video reports in MP4 format were created shortly after the completion of select chest studies using SnagIt screen capture and Philips iSite software, as well as a dedicated website, www.rayvid.com created by the authors. Video reports were created from 13 chest CT and plain film studies ordered by 5 attending level internal and emergency medicine physicians and 4 medicine residents. Attending clinicians rated the video reporting system on its quality, helpfulness, and their willingness to use it again on a 5-point scale, with 5 being the most positive response. Residents rated the system’s quality, comparison with in-person consultations, and educational value on 5, 4, and 3-point scales, respectively.

Results: Video reports were accessible to referring clinicians using a mobile device or laptop computer. Average attending responses for video reporting quality, helpfulness, and willingness to use again were 4.8/5.0, 5.0/5.0, and 5.0/5.0, respectively. In one case an attending reported a change of clinical plan as a result of the video report. Average resident responses to the system’s quality, comparison with in-person consultation, and educational value were 5.0/5.0, 3.1/4.0, and 3.0/3.0, respectively.

Conclusions: Radiology video reporting was helpful to a group of attending clinicians and provided educational value to residents, being similar to in-person consultations.

Clinical Relevance: This technology may help retain the chest radiologist’s direct and visible role in education and patient care in the modern hospital setting.

Weight Based Thresholds to Reduce Radiation Dose in Diagnostic 64 Slice MDCT of the Thorax

KESSLER A, Chaturvedi A and Hobbs SK

Objectives: As MDCT has become more widely used in clinical practice, many techniques involving adjusting the tube current time (mAs) have been created to reduce dose without compromising image quality. The purpose of this study was to determine the usefulness of combining weight based mAs thresholds with vendor specified tube current modulation techniques to reduce radiation dose by at least 10% for patients receiving diagnostic thoracic CT’s.

Materials/Methods: One 64 slice MDCT scanner was utilized and an algorithm was created where a mAs maximal threshold was applied according to the patient’s weight (ie: 40-59 kg: 150 mAs, 60-74 kg: 250 mAs, etc). Patients with scans before and after algorithm implementation were included with the prior scan used as a control for comparison. 70 patients were identified. 52 had a prior CT performed on the same scanner (Group 1). 18 patients had a prior CT performed at an outside institution on a similar 64 slice MDCT (Group 2). All scans were reconstructed using a 30% blend of iterative reconstruction and 70% filtered back projection. Dose length products were used to calculate effective doses. Image quality was assessed both objectively and subjectively. Objective evaluation was performed by measuring Hounsfield Unit standard deviations at the locations of maximal mAs usage (A region of liver in the upper abdomen and muscle at the thoracic inlet). Subjective evaluation was performed by an independent radiologist using a Likert grading scale of 1-4.

Results: Group 1 demonstrated a statistically significant 19.9% mean decrease in effective dose (p value < 0.01). Group 2 demonstrated a statistically significant 40.9% mean decrease in effective dose (p value < 0.01). Subjective assessment of image quality demonstrated no difference between the prior and post scans.

Conclusions: Combining a weight based mAs threshold with tube current modulation techniques can significantly reduce radiation dose without sacrificing image quality.

Clinical Relevance: Applying a weight based mAs threshold reduces radiation and can be easily implemented with most CT scanners.
Effectiveness of MR Angiography for the Evaluation of Acute Pulmonary Embolism

**Objectives:** To assess negative predictive value (NPV) of magnetic resonance imaging (MRI) in excluding pulmonary embolism (PE) in patients presenting to the emergency department (ED) in the following categories: a) < 40 years and/or b) contraindication to iodinated contrast.

**Methods:** Retrospective study IRB-approved. From January 2013 to September 2014, MRI was obtained as the primary diagnostic modality for patients with suspected PE who fulfilled the inclusion criteria. Results were classified as a) positive, b) negative or c) indeterminate for PE. Patients with negative MRI for PE were reassessed by retrospective review of medical records for subsequent development of PE or deep venous thrombosis (DVT). Patients with negative MRI for PE were categorized as false negatives if the patient had DVT on initial presentation and/or developed PE/DVT after initial MRI examination.

**Results:** 130 patients presented to ED with suspected PE and underwent MRI. 115/130 (88%) had negative MRI and 12/130 (9%) had positive MRI for PE. Three out of 130 patients (2%) had negative MRI for PE but positive for DVT and were classified as false negative. Out of remaining 112 patients with negative MRI for PE and DVT, retrospective records reviewed at 3 months after presentation identified no subsequent PE or DVT. Negative predictive value of MRI was 98% in our patient population.

**Conclusion:** MRI is effective in excluding pulmonary embolism on patients < 40 years old and/or who have contraindication to iodinated contrast. **Clinical Relevance:** MRI can improve patient safety by reducing exposure to ionizing radiation and iodinated contrast when imaging is required to exclude PE.

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Improving Quality of Computed Tomographic Pulmonary Angiography (CTPA)

**Objectives:** As a quality improvement effort, small changes were applied to our standard CTPA protocol in one of our scanners. The changes were hypothesized to improve quality of CTPA by increasing peak opacification of the pulmonary arteries and increase detection of pulmonary emboli (PE).

**Materials/Methods:** A retrospective analysis of 406 CTPA studies acquired between November 1, 2013 and May 1, 2014 was performed. A total of 225 studies (143 female, 82 male; mean patient age of 49 +/- 17 years) were acquired using Scanner A (Sc A) and standard protocol and 181 studies (107 female, 74 male; mean patient age of 54 +/- 16 years) were acquired using Scanner B (Sc B) and modified protocol. Sc A and Sc B were identical in brand, year and technical specifications. Patients were assigned to Sc A or Sc B based on time of day and scanner availability. Sc A used a cranial-caudal scan direction, pitch of 0.9, and rotation time of 0.5 seconds/rotation. Sc B used a caudal-cranial scan direction, pitch of 1.0, and rotation time of 0.4 seconds/rotation. Scan delay time was determined with a test bolus injection with time to peak measured at the level of the main pulmonary artery (PA) on Sc A and at the right ventricle (RV) on Sc B. All other parameters remained equal between the two protocols/scanners.

**Results:** The mean density of the contrast enhanced main PA was greater with Sc B (331.1 +/- 95.6 HU to 307.3 +/- 105.3 HU), percentage of limited studies was lower (17.1% to 23.3%), and rate of diagnosis of PE was higher (12.7% to 7.2%) while using less contrast (70.2 +/- 21.2 cc to 74.3 +/- 13.8 cc). The observed differences were all significant (p < 0.05).

**Conclusions:** Small modifications in our CTPA protocol (determining the scan delay time at the RV, scanning in the caudal-cranial direction, increasing pitch and gantry rotation) improved the quality of our CTPA studies by increasing peak PA opacification.

**Clinical Relevance/Application:** The protocol changes improved the quality of CTPA. Similar changes at other institutions may yield similar results.
Normal Thymus in Adults: Appearance on CT and Associations with Age, Sex, BMI and Smoking

ARAKI T, Nishino M, Gao W, Dupuis J, O’Connor GT and Hatabu H

Objectives: To investigate the appearance and size of the normal thymus on CT in middle aged and older adults, and their associations with participants’ characteristics.

Materials/Methods: In this IRB approved study, 2540 participants (mean 58.9 years, female 51%) of the Framingham Heart Study were evaluated for the CT appearance of thymic glands with four-point scores (ranging 0 to 3 according to the ratio of fat and soft tissue) and size. We investigated the correlation of these features with participants’ characteristics including age, sex, BMI (body mass index), smoking status and pack-years.

Results: Of 2540 participants, 1869 (74%) showed complete fatty replacement of the thymus (Score 0), 463 (18%) predominantly fatty attenuation (Score 1), 172 (7%) half fatty and half soft-tissue attenuation (Score 2), and 36 (1%) solid thymic gland with predominantly soft-tissue attenuation (Score 3). Female participants showed less fatty degeneration of the thymus with higher thymic scores within age 40-69 (p < 0.001). Participants with lower thymic scores showed higher BMI (p < 0.001) and more likely to be former smokers with higher pack-years (p < 0.001).

Conclusions: Visual assessment with four-point thymic scores revealed a sex difference in the fatty degeneration of the thymus with age. Women show significantly higher thymic scores than men, suggesting less fat content of the thymus, during age 40-69 years. Cigarette smoking and high BMI are associated with advanced fatty replacement of thymic gland.

Clinical Relevance/Application: Normality of the thymus has been elusive to define and normal thymus is sometimes misdiagnosed as an anterior mediastinal lesion. Knowing the normal appearance of the thymus and patient’s characteristics is essential for a precise diagnosis of thymic lesions.