Society of Thoracic Radiology
Oral Presentations
Scientific Session I
Sunday, March 16, 2014

Moderators: Sujal R. Desai, MBBS and Terrance T. Healey, MD

01  7:20 AM  A Multicenter Evaluation of Observer Agreement for HRCT Patterns of Fibrosis in Age Stratified Subgroups and its Relevance to Survival Prediction
Simon L.F. Walsh, MD, PhD
WALSH SLF, Calandriello L, Sverzellati N, Wells AU and Hansell DM

02  7:30 AM  HRCT Classification of UIP Diagnosed by Surgical Lung Biopsy
Kunihiro Yagihashi, MD
YAGIHASHI K, Huckleberry J, Colby TV, Sundaram B, Pipavath S and Lynch DA

03  7:40 AM  Quantitative CT in the Follow Up of Functionally Stable Lung Transplant Recipients
Mario Silva, MD

04  7:50 AM  Characteristic Imaging Findings of Pleuroparenchymal Fibroelastosis Following Bone Marrow Transplant
Elizabeth K. Weihe, MD
WEIHE EK, Sehgal S, Illei P, Fishman E and Danoff S

05  8:00 AM  CT Phenotyping of Refractory Asthmatics
Stephen Hobbs, MD
HOBBS S, Jou S, Zach J, Good J, Martin R and Lynch D

06  8:10 AM  Computerized Tomography Correlates with Ventilator Days in Inhalation Injury: Preliminary Data from the Inhalation Severity Injury Scoring System (ISIS) Trial
David L. August, MBA, MD
AUGUST DL, Foster K, Richey K, Gridley D, Peck M and Pressman M
A Multicenter Evaluation of Observer Agreement for HRCT Patterns of Fibrosis in Age Stratified Subgroups and its Relevance to Survival Prediction

WALSH SLF, Calandriello L, Sverzellati N, Wells AU and Hansell DM

Objectives: To evaluate the observer agreement among thoracic radiologists for honeycombing and traction bronchiectasis on HRCT in a cohort of patients with all-comers fibrotic lung disease. The relevance to survival prediction in age-stratified subgroups was also investigated.

Methods: 75 thoracic radiologists scored 150 cases of various fibrotic lung diseases for honeycombing, traction bronchiectasis and emphysema using a 3 point score for each (absent, possibly present, definitely present). Average scores were also calculated. Observer agreement and survival analysis was performed in age-stratified subgroups of patients (>70, >65, >60, >55, >50 and 70, >65, >60, >55, >50 and 50 years old).

Conclusion: Observer agreement for honeycombing was superior to observer agreement for traction bronchiectasis. The identification of honeycombing was not significantly perturbed by the presence of traction bronchiectasis or emphysema. Patient age impacts observer agreement for honeycombing and traction bronchiectasis.

HRCT Classification of UIP Diagnosed by Surgical Lung Biopsy

YAGIHASHI K, Huckleberry J, Colby TV, Sundaram B, Pipavath S and Lynch DA

Objectives: To compare radiologic and histologic diagnoses in a large population of subjects enrolled in multicenter studies of idiopathic pulmonary fibrosis.

Methods/Materials: We retrospectively reviewed the HRCT findings in 680 participants in three studies sponsored by the IPFNET study network. CT appearances were classified by two thoracic radiologists according to ATS criteria as UIP, possible UIP, and inconsistent with UIP. Among these cases, 290 subjects had undergone surgical biopsy. Biopsy findings were classified by an expert pathology panel as definite UIP, probable UIP, possible UIP, and not UIP.

Results: One hundred and twenty (41.4%) of 290 subjects had UIP pattern on HRCT, 71 (24.5%) had probable UIP, and 99 (34.1%) had inconsistent UIP. 117 (97.5%) of those with UIP pattern on HRCT had probable or definite UIP on biopsy (concordant group), but 88 (88.9%) of those with a CT pattern inconsistent with UIP had definite or probable UIP on biopsy (discordant group). Among the discordant cases, 63 (70.1%) of the inconsistent CT findings were due to diffuse mosaic/air-trapping, 22 (24.7%) due to extensive ground glass abnormality, 23 (25.8%) due to upper or mid-lung predominance, 36 (40.4%) due to diffuse distribution, 11 (12.4%) due to peribronchovascular predominance, 23 (25.8%) due to diffuse axial predominance. Results were similar when analysis was restricted to the 103 individuals who underwent surgical biopsy within one year of CT. When comparing the concordant and discordant groups, there was no significant difference in mean age, gender, FVC% predicted, DLCO% predicted, or history of antigen exposure.

Conclusions: The UIP pattern on HRCT is highly correlated with pathological definite or probable UIP. However, in this selected population, 88.9% of those with an inconsistent UIP pattern on HRCT showed definite or probable UIP on histologic evaluation. Detailed radiologic-pathologic consensus evaluation is required in this subset of individuals. The diagnostic criteria for inconsistent UIP on CT may require adjustment.
Quantitative CT in the Follow Up of Functionally Stable Lung Transplant Recipients


Objectives: To quantify lung parenchymal changes in functionally stable lung transplant recipients using combined inspiratory and expiratory CT.

Methods/Materials: Twenty patients after double lung transplantation, all of which were stable with regards to clinical presentation and lung function (i.e., no evidence of graft rejection), underwent yearly combined inspiratory and expiratory CT examinations over 5 years. Lung parenchymal densitometric and quantitative airway metrics were calculated with dedicated software. The longitudinal evolution of the metrics was compared within individual patients, and relative changes were compared between individuals. Comparisons were performed using analyses of variance for repeated measurements, and linear regression analyses were used for data modeling.

Results: Over the 5-year study period, CT measured lung weight and histogram peaks showed statistically significant decreases (p=0.012 and p 0.05).

Conclusions: On quantitative CT, functionally stable lung transplant recipients show a consistent pattern of longitudinal tissue loss, combined to increasing gas trapping. None of these changes are detected by the lung function test currently used as reference standard for following these patients.

Characteristic Imaging Findings of Pleuroparenchymal Fibroelastosis Following Bone Marrow Transplant

WEIHE EK, Sehgal S, Illei P, Fishman E and Danoff S

Objective: Late stage pulmonary complications following bone marrow transplant (BMT) are a significant cause of morbidity and mortality. Pleuroparenchymal fibroelastosis (PPFE) is a rare form of fibrotic lung disease characterized by intra-alveolar fibrosis with dense fibrotic visceral pleural thickening. Although most reported cases are idiopathic, there are reports suggesting association with BMT. This is a retrospective study of the clinical course and imaging features of 6 BMT patients who subsequently developed PPFE.

Methods: A retrospective review of lung pathology specimens identified six patients post BMT with confirmed PPFE on lung explant pathology. A chart review was performed assessing the diagnostic workup, including bronchoscopy. Imaging review was performed of all CT scans and compared to pathology findings.

Results: All six patients presented to ILD clinic following BMT for evaluation of new onset pulmonary symptoms. On imaging all six patients demonstrated diffuse upper lobe predominant dense pleuroparenchymal thickening, and 2 patients had serial imaging documenting the indolent progression of disease prior to respiratory symptoms. Imaging findings correlated to mixed histology in 4 patients, including UIP, NSIP, and BO patterns. Acute complications including infection and pneumothorax were also observed.

Conclusions: PPFE is a rare form of progressive fibrotic lung disease of unknown etiology. Described here are 6 patients who developed PPFE after BMT. Imaging findings prior to diagnosis revealed characteristic features of fibrotic lung disease including upper lobe predominant dense pleuroparenchymal thickening which correlated with pathology. Recognition and awareness of these imaging findings may aid in the early diagnosis and management of PPFE in BMT patients.
**CT Phenotyping of Refractory Asthmatics**

HOBBS S, Jou S, Zach J, Good J, Martin R and Lynch D

**Objective:** Recently, Good et al. demonstrated five phenotypes of refractory asthma (gastroesophageal reflux, subacute bacterial infection, tissue eosinophilia, combination, and non-specific subtypes) based on bronchoscopy. This study aims to determine if CT can contribute toward recognition of these phenotypes.

**Methods:** Patients with a refractory asthma diagnosis who were phenotyped by bronchoscopy, and who had a CT within one month of bronchoscopy were included in the study protocol. A total of 56 patients were identified. CT scans were reviewed in blinded fashion by two radiologists, scoring the presence and extent of ground glass opacity, centrilobular nodules, tree-in-bud, bronchiectasis, bronchial wall thickening, mucoid impaction, mosaic attenuation, air trapping, linear scarring, hiatal hernia, esophageal dilation, esophageal air fluid level, and esophageal wall thickening.

**Results:** Gastroesophageal reflux was the most common phenotypic expression with 44 subjects (79%). 24 subjects (43%) presented with subacute bacterial infection, while 10 subjects (18%) had eosinophilia. Some of these expressed a combination phenotype. There was a higher prevalence and extent of linear scarring in subjects with subacute bacterial infection than in those without (p=0.04). Bronchial wall thickening was noted in every lobe for every subject with tissue eosinophilia. Subjects with eosinophilia had a relative risk of having diffuse bronchial wall thickening of 1.84 (1.41-2.40) versus those without eosinophilia.

**Conclusion:** These findings suggest that CT can contribute to phenotyping refractory asthmatics. The presence of linear scarring should suggest subacute bacterial infection. The presence of diffuse bronchial wall thickening should suggest the eosinophilic subtype of refractory asthma.

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**Computerized Tomography Correlates with Ventilator Days in Inhalation Injury: Preliminary Data from the Inhalation Severity Injury Scoring System (ISIS) Trial**

AUGUST DL, Foster K, Richey K, Gridley D, Peck M and Pressman M

**Objective:** The goal of this multicenter study is to develop a standardized scoring system for inhalation injury (II) that quantifies and predicts II severity in adult burn patients.

**Methods:** Data from burn patients with II enrolled to date in the ISIS study at one center were evaluated. II was diagnosed based on history, physical exam, lab data, and bronchoscopy findings. II severity was scored on a scale of 1-5 for carbon staining, edema, secretion, and erythema. Data included demographics, burn and II data, and outcome. Outcome data included mortality, ventilator days, ICU days, bronchoscopy score, and CT findings. Descriptive data was calculated and correlated to assess for presence and strength of associations among variables.

**Results:** 7 subjects were enrolled with II during the first 9 months of the study. Mechanism of injury for all subjects was fire/flame. Mean body surface area burned was 20.3% (range 0-80%). Average ventilator time was 17 days, length of stay 21 days, and 1 death (14%). Average total bronchoscopy score was 7.9 (range 3-11). Average score for II severity was 3.3 (range 1-4) for carbon staining, 2 (range 0-3) for edema, 1.6 (range 1-2) for secretions, and 1 (range 0-2) for erythema. 43% of patients had pleural effusions present on CT. Average CT score/slice was 3.0 (range 0.8-5.1) and fraction of abnormal lung tissue (FALT) was 6.8% (range 0.1-18.6%). There were statistically significant associations (p<0.10) between CT score and ventilator days (R=0.678); ICU length of stay (R=0.68); and total hospital days (R=0.623).

**Conclusion:** Preliminary data from ISIS demonstrated CT findings correlate positively with ventilator days in burn patients with II, suggesting that CT chest examination may be helpful in predicting the severity of lung injury and likely clinical course in burn patients.