Society of Thoracic Radiology
Oral Presentations
Scientific Session II
Monday, March 17, 2014

Moderators: Edwin F. Donnelly, MD & Baskaran Sundaram, MBBS, MRCP, FRCR

07 7:20 AM  Ground Glass Nodules: CT-Epidemiological Analysis of Growth Patterns
Mario Silva, MD
SILVA M, Centra F, Colombi D, Ampollini L, Sverzellati N and Bankier AA

08 7:30 AM  Usefulness of Texture Analysis in Differentiation of Benign from Malignant Mediastinal Lymph Nodes in Patients with Primary Pulmonary Malignancy
Hamid Bayanati, MD, FRCPC
BAYANATI H, Dennie C, Souza C, Gupta A, Thornhill R and Sethi-Vermani V

09 7:40 AM  Radiation Risks Associated with Lung Cancer Screening: Real or Myth?
David Brandel, MD
BRANDEL D, Frank L, Christodoulou E and Kazerooni E

10 7:50 AM  Diagnostic Yield and Accuracy of Percutaneous CT-Guided Fine Needle Aspiration of Subsolid Lesions in the Lung
Kyungmouk S. Lee, MD
LEE KS, Pua BB, Du JY and Schreiner AM

11 8:00 AM  Usefulness of Imaging-Guided Percutaneous Needle Biopsy (PNB) in the Diagnosis of Pulmonary Ground Glass Nodules (GGNs)
Hamid Bayanati, MD, FRCPC
BAYANATI H, Dennie C, Souza C, Gupta A, Peterson R and Sethi-Vermani V

12 8:10 AM  Percutaneous Cryoablation in Treatment of Metastatic Thymoma: Efficacy and Safety
Fereidoun Abtin, MD
ABTIN F, Nasehi L, Suh R, Han SX, Hsu W and Sayre J
Ground Glass Nodules: CT-Epidemiological Analysis of Growth Patterns

SILVA M, Centra F, Colombi D, Ampollini L, Sverzellati N and Bankier AA

Objectives: To quantify growth patterns of solitary pure ground glass nodules and to relate these pattern to epidemiological factors.

Methods/Materials: Between 2008 and 2011, 95 patients were diagnosed on CT with solitary pure ground glass nodule (pGGN) at our hospital. CT features of pGGNs were evaluated at an initial and a follow-up CT. pGGNs were divided into “persisting” or “resolved”. Persisting nodules were further classified according to potential changes in total or solid component diameter into “decreased”, “unchanged”, and “increased”. Clinical and demographic data were recorded. Association of data with morphological pGGNs characteristics were tested with Kruskall-Wallis test and logistic regression. Results: After a median follow up of 16 months, 19/95 (20%) pGGNs resolved and 76/95 (80%) persisted. Of the persisting pGGNs, 51/76 (67.1%) were unchanged, 18/76 (23.7%) increased in size, and 7/76 (9.2%) decreased. Growth was more likely with age ≥ 67 years and a diameter ≥ 10 mm (OR 4.636; p=0.016). No significant relation was found between pGGNs growth and gender, history of cancer, or pGGN location. pGGN resolution was more likely with age < 67 (OR 3.28; p=0.04). No difference in diameter was found between resolved and persisting pGGNs (p=0.21).

Conclusions: Persisting larger solitary pGGNs were more likely to grow than smaller pGGNs. Moreover, pGGN growth was more likely to occur in older than in younger patients. This observation could help to fine-tune future follow-up recommendations for pGGNs with regard to the seemingly paradoxical influence of patient age.

Usefulness of Texture Analysis in Differentiation of Benign from Malignant Mediastinal Lymph Nodes in Patients with Primary Pulmonary Malignancy

BAYANATI H, Demnie C, Souza C, Gupta A, Thornhill R and Sethi-Vermani V

Objectives: To determine the usefulness and diagnostic accuracy of quantitative pattern analysis in the characterization of mediastinal lymph nodes and whether specific findings may help to differentiate benign nodes from malignant adenopathy.

Materials and Methods: The study was approved by the institutional review board. The CT images of 43 patients with primary lung cancer who had biopsy (resection, mediastinoscopy or EBUS/EUS) of mediastinal lymph nodes within 3 months interval, were retrospectively analyzed. Quantitative CT image features related to grey-level heterogeneity and LN morphology were extracted from 72 LNs (41 benign and 31 malignant). We entered these features into a logistic regression model and evaluated ROC curves with pathology-confirmed diagnosis as outcome. Results: Combined quantitative CT image texture and morphologic features were capable of delineating malignant mediastinal nodes with 81% sensitivity, 80% specificity and an area under the ROC curve of 0.87 (P<0.0001).

Conclusions: Texture analysis is useful in differentiating benign from malignant lymph nodes on non-enhanced CT thorax in patients with primary lung cancer.
**Diagnostic Yield and Accuracy of Percutaneous CT-Guided Fine Needle Aspiration of Subsolid Lesions in the Lung**

**LEE KS, Pua BB, Du JY and Schreiner AM**

**Objective:** To evaluate the diagnostic yield and accuracy of percutaneous CT-guided fine needle aspiration biopsy (CT-FNAB) of subsolid lesions in the lung.

**Method/Materials:** After approval by the institutional review board, we performed a retrospective review of 121 patients with 123 subsolid lesions that underwent CT-FNAB from January 2006 to August 2012. Lesions were categorized based on the degree of their solid components: “pure GGO” lesions having no solid component (n=50), “intermediate” lesions having less than 50% solid component (n=25), and “predominantly solid” lesions having more than 50% solid component (n=48). Diagnostic yield was defined as having an FNAB sample that was sufficient to produce a pathologic diagnosis. Of 123 lesions biopsied, 67 were treated with surgical resection; of these lesions, the diagnostic accuracy/concordance of the biopsy was determined by comparing the biopsy histology with final surgical pathology. Post-procedural pneumothorax and chest tube placement were also reviewed. Univariate analysis was conducted using chi-squared tests for categorical variables and student’s t-test for continuous variables.

**Results:** Diagnostic yield of CT-FNAB was 89%. The yield was 76% for “pure GGO” lesions (OR: 0.089, p<0.001), 96% for “intermediate” lesions (OR: 3.7, p=0.193), and 98% for “predominantly solid” lesions (OR:9.855, p<0.01). The average size of the solid component for lesions with a positive diagnostic yield was 0.87±0.82cm, while the average size of the solid component for lesions with a negative diagnostic yield was 0.09±0.27cm (p<0.0001). Of the 123 lesions biopsied, 67 lesions were treated with surgical resection. Final pathologic diagnosis revealed 65 malignancies, 2 atypical adenomatous hyperplasias and no benign lesions. The overall concordance of CT-FNAB with resected lesions was 82%. Post-biopsy pneumothoraces were identified in 13 of 123 (11%) lesions, with 3 (2%) requiring a chest tube.

**Conclusion:** CT-FNAB of subsolid lesions in the lung is safe and high-yield for obtaining an accurate pathologic diagnosis.

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**Radiation Risks Associated with Lung Cancer Screening: Real or Myth?**

**BRANDEL D, Frank L, Christodoulou E and Kazerooni E**

**Objectives:** 1. To review and describe the existing data regarding lifetime risk as a result of radiation exposure. 2. To discuss the benefits and risks of using CT for lung cancer screening in the population of individuals identified by the National Lung Cancer Screening Trial.

**Principal Information:** The exhibit will discuss the results and ramifications of the National Lung Cancer Screening Trial data, published in 2011. A review of the available data and mathematical models regarding lifetime radiation risk will be presented. Current developments and techniques in reducing CT dose will be emphasized.

**Conclusions:** Lung cancer screening with low dose CT is poised to make a great impact in the landscape of lung cancer as we know it. Reducing mortality from lung cancer, the leading cause of cancer death in men and women, is an important public health measure, and widespread adoption appears imminent. The risks associated with radiation exposure from annual low dose screening CT are very low, and should not deter high risk individuals.
Usefulness of Imaging-Guided Percutaneous Needle Biopsy (PNB) in the Diagnosis of Pulmonary Ground Glass Nodules (GGNs)

BAYANATI H, Demnie C, Souza C, Gupta A, Peterson R and Sethi-Vermani V

Objectives: The role of PNB in sub-solid lesions, particularly fine needle aspiration (FNA), is currently considered limited, greatly due to reported low diagnostic accuracy. The recent guidelines recommend resection of growing GGNs or persistent part solid nodules. The purpose of this study is to determine the accuracy of PNB (FNA and core) in preoperative diagnosis of predominantly GGNs.

Methods: The REB approved the study. All CT-guided PNB performed at the Ottawa hospital from Jan. 2004 to Jan. 2013 were retrospectively reviewed.

Results: Of 103 CT-guided PNB performed for predominantly GGNs, 59 were for either pure GGN or GGN with solid component < 5 mm. 57 were in adenocarcinoma spectrum and 2 were benign. 20 patients had surgical resection and diagnosis of adenocarcinoma was confirmed. The FNA alone was diagnostic in 15 patients. In 3, diagnosis confirmed with core biopsy. In 1 core was not done and in 1, both FNA and core were inconclusive. There was no false positive. The sensitivity, specificity and accuracy for FNA are 75%, 100% and 85%, and for FNA and core combined are 90%, 100% and 100%.

Conclusions: 100% of growing (96% of non-resolving) GGNs are premalignant or malignant adenocarcinomas. If diagnosis prior to surgery or radiotherapy is required, PNB is 100% accurate and therefore, useful.

Percutaneous Cryoaulation in Treatment of Metastatic Thymoma: Efficacy and Safety

ABTIN F, Nasehi L, Suh R, Han SX, Hsu W and Sayre J

Objectives: Thymoma is the most common anterior mediastinal tumor. After surgery, many patients develop pleural drop metastasis. Percutaneous Cryoaulation (PCT) is a local ablative technique but its role in management of metastatic thymoma has not been described. We evaluated efficacy and complications of PCT in local control of thymoma metastasis.

Material and Methods: This is a retrospective observational study of thymoma drop metastasis after thymectomy treated with PCT from 2008 to 2012. Patients were followed up with imaging. Multiple technical and clinical variables were assessed and stepwise multiple variable logistic regression model was used to identify significant imaging and clinical predictors of local control.

Results: PCT was performed on 5 patients with 25 lesions (1-16 per patient) at chest wall 8 (32%), pleura 12 (48%), mediastinum 2 (8%) and lung 3 (12%). Conscious sedation was used for 19 (76%) and general anesthesia for 6 (24%) ablations, with 1-3 (median:1) ablations per session. Median hospital stay was <1 day and it didn’t exceed 2 days. Median 2 freeze cycles (range 2-6) per lesion for median duration of 20’ (range 10-40). Median size of tumor at long axis was 34.6 mm (range 12-81) and at short axis was 15.4 mm (6-25). 5/25 (20%) ablations had 0 mm margin, 3/5 were on lesion single lesion abutting aorta (it recurred twice). On follow up imaging 2/25 (8%) recurred as shown by increased size and nodular enhancement. Immediate complications was absent in 23/25 (92%), 1 pneumothorax and 1 pulmonary hemorrhage. After 24 hours 5/25 (20%) ablations had the following complications: 1 (4%) pneumonitis, 1 (4%) pain, 2 (8%) rib fracture, 1 (4%) myasthenia gravis flare, and 1 (4%) delayed pneumothorax and moderate left pleural effusion requiring thoracenthesis.

Conclusion: Percutaneous cryoaulation for metastatic thymoma allows treatment of multiple lesions with (23/25) 92% local control rate. Proximity of tumor to aorta is possible cause for sink effect and local recurrence. The complications are limited and managed during the ablation.