Conclusions: Statistically significant improvements to 3He-MRI to planning CT image registration can be achieved by using a dedicated imaging protocol that enables both 3He-MRI and planning CT to be acquired with similar breath holds and body position. Improved image registration accuracy will be beneficial when performing functionally-weighted IMRT planning.

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P1-067 **Imaging and Staging Posters, Mon, Sept 3**

Prognosis of small adenocarcinoma of the lung based on thin-section CT and pathological preparations

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Background: We have previously reported that tumor opacity in the mediastinal window image in thin-section CT (TS-CT) is associated with prognosis of lung adenocarcinoma of 20 mm or smaller in diameter. However, pathological investigation of the tumor opacity in the mediastinal window has not been performed in detail. To investigate the relationship between imaging and pathological findings, the solid lesion in the pathological preparation observed under a magnifying glass (SLP) and tumor opacity in the mediastinal window image (TOM) in TS-CT were compared. The relationships of SLP and TOM with relapse were also investigated.

Methods: The subjects were 115 patients with a lung adenocarcinoma of 20 mm or smaller in diameter who underwent surgical resection at the Kanagawa Cancer Center between January 1997 and October 2003. Pathological and imaging findings for these patients were re-investigated in this study. Patients with bronchioloalveolar carcinoma (BAC) that was undetectable in the mediastinal window image were excluded. SLP was defined as follows: 1) regions with alveolar collapse, 2) regions accompanied by destruction of the alveolar framework, and 3) regions described in 2) accompanied by collagen fibrotic foci. The maximum diameters of the tumor and SLP were measured in the pathological preparation, and the proportion of the maximum diameter of the SLP to the maximum tumor diameter was calculated as the pathological ratio. In TS-CT, the proportion of the reduction in the TOM maximum diameter to the maximum diameter of the tumor opacity in the lung window was calculated as the reduction percentage. Correlations between the maximum SLP and TOM diameters and between the pathological ratio and the reduction percentage were investigated, and the association of relapse with SLP, TOM, the pathological ratio, and reduction percentage was also examined.

Results: Strong Pearson correlations were noted between the maximum TOM and SLP diameters (correlation coefficient: 0.852, $p<0.0001$) and between the reduction percentage and pathological ratio (correlation coefficient: 0.895, $p<0.0001$). The maximum TOM and SLP diameters were not significantly associated with relapse. However, the incidence of relapse was significantly higher in patients with a reduction percentage of less than 50% by log-rank test; no relapse occurred in patients with a reduction percentage of 50% or higher. Similarly, the incidence of relapse was significantly higher in patients with a pathological ratio of less than 50% by log-rank test; no relapse occurred in patients with a pathological ratio of 50% or higher in the pathological preparation.

Conclusions: Use of the reduction percentage in TS-CT to classify lesions into two groups with different prognoses is valid based on the pathological investigation. Therefore, measurement of the reduction percentage and pathological ratio may allow prediction of cases of small adenocarcinoma of the lung with a good prognosis.

P1-068 **Imaging and Staging Posters, Mon, Sept 3**

Comparison of RECIST, WHO criteria, and serum CEA for evaluation of tumor response to chemotherapy in non-small cell lung cancer

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Background: Response evaluation criteria in solid tumor (RECIST) is widely used as a standard method for evaluation of tumor response in clinical oncology. RECIST is based on uni-dimensional measurement of target lesions and is simpler than WHO criteria which are based on bi-dimensional measurement. In clinical practice, we sometimes use serum tumor markers to estimate tumor response as well, particularly when measurement of tumor size is difficult. The aim of this study is to compare WHO criteria, RECIST, and serum carcinoembryonic antigen (CEA) level for evaluating tumor response to chemotherapy in non-small cell lung cancer (NSCLC).

Patients and Methods: During an 11-year period from 1995 through 2005, 24 NSCLC patients with high serum CEA level (> 5ng/ml) at presentation were retrospectively analyzed. They underwent pulmonary resection after induction chemotherapy. In each case, we compared histological response of tumor response of resected specimens.

Results: Using WHO criteria, nine and 15 patients achieved partial response (PR) and no change (NC), respectively. With RECIST, PR was seen in 11 patients, stable disease (SD) in 13. Concordance between WHO and RECIST was 83 %. When we compare CEA level before chemotherapy with that obtained after chemotherapy, CEA levels significantly decreased in PR group defined by WHO criteria [26.3 (median) ng/ml to 4.3 ng/ml, $P = 0.008$, wilcoxon t test] or RECIST [17.3 ng/ml to 4.4 ng/ml, $P = 0.004$, wilcoxon t test]. On the contrary, in patients whose responses were NC or SD, there was no significant difference [16.8 ng/ml to 9.9 ng/ml, $P = 0.24$, 16.8ng/ml to 19.6 ng/ml, $P = 0.24$, respectively]. In comparison of CEA level with histologic response, CEA decreased significantly in patients in whom less than one-third of tumor cells were viable [17.3 ng/ml to 4.4 ng/ml, $P = 0.008$, wilcoxon t test] but not in whom more than two thirds of tumor cells were viable [16.8 ng/ml to 7.9 ng/ml, $P = 0.06$, wilcoxon t test]. From

the receiver operating characteristic curve analysis, 60% reduction of CEA level should be an appropriate cut-off value in predicting good response to the chemotherapy. In this condition, the sensitivity and spescifciity of CEA for RECIST were 82.8% and 69.2%, respectively.

Conclusions: Determination of changes in serum CEA level appeared to be useful as an surrogate index for evaluation of tumor response to chemotherapy that would result in comparable judgment with RECIST in patients with NSCLC who had elevated CEA level before treatment.

P1-069 **Imaging and Staging Posters, Mon, Sept 3**

CT findings of lung cancer detected on low-dose CT screening in National Cancer Center Korea

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Background: Although there have been many controversies in lung cancer screening, low-dose CT (LDCT) is currently used in clinical research studies or even in practice in many countries. There are few reports about lung cancer screening with LDCT from Asia except Japan.

Materials and Methods: Between May 2001 and February 2006, a total of 11,974 asymptomatic adults (≥ 40 years) who underwent LDCT for lung cancer screening were retrospectively analyzed. We assessed overall detection rates, demographic findings, staging, histology, and CT findings of lung cancers found on LDCT.

Results: There were 6,612 men and 5,362 women with age range from 40 to 92 years (mean, 53.7±8.2 years). Lung cancers were detected in 25 individuals (0.21%) either initial (n=20) or annual follow-up LDCT (n=5). They were 12 men and 13 women with age range from 45 to 73 years (mean, 58±8 years). Fifteen patients were non-smokers and 10 were smokers. They were all non-small cell cancer (16 stage IA, 5 stage IB, 1 stage II, and 3 stage IIIA) with the histology of bronchioloalveolar carcinoma (BAC, n=8), adenocarcinoma (n=14), squamous cell (n=2) and large cell carcinoma (n=1). Twenty-six lesions in 24 patients appeared as a nodule with ground-glass opacity (GGO, n=5), mixed GGO (n=9) or solid (n=12) with mean size of 17.6±6.7 mm (range, 5-36 mm) while only one as endobronchial mass. The histologic type of GGO or mixed GGO nodule was BAC or adenocarcinoma with BAC features. Four BAC appeared as solid nodules. Details of four symptom-diagnosed cancers were given in Table 1. They were all smokers.

Patient	Sex	Age (years)	Histology	Stage	Interval (months)	Findings in initial LDCT
1	M	53	Squamous	IB	8	Focal bronchial thickening
2	M	54	NSCLC	IV	30	Peripheral solid nodule (7mm)
3	M	56	Adeno, PD	IIIB	37	Subtle hilar bulging
4	M	46	Adeno, PD	IV	29	Normal even on retrospect

Conclusion: The overall detection rate was 0.21% in LDCT screening of asymptomatic adults older than 40 years. Most of screen-detected lung cancers were stage I (84%) with histology of adenocarcinoma including BAC. More than 90% of screen detected lung cancers were appeared as a peripheral nodule with either GGO, mixed or solid. Symptom-detected lung cancers were more aggressive and could be unrecognized since they are located in central on initial LDCT scans.

P1-070 **Imaging and Staging Posters, Mon, Sept 3**

Bronchioloalveolar cell carcinoma and Adenocarcinoma with bronchioloalveolar cell feature: radiologic-pathologic correlation

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Background: Bronchioloalveolar cell carcinoma (BAC) component is a prognostic indicator and well correlated with GGO area on HRCT. However, it does not always appeared as GGO area. The purpose of our study was to determine the histologic findings of non-GGO area when there is discrepancy between the area of GGO on CT and BAC area on histopathology.

Materials and Methods: The subjects were 66 patients with BAC and adenocarcinoma with BAC feature smaller than 3 cm in largest diameter in who underwent lung resection between March 2001 and June 2004. They were 29 men and 37 women with mean age of 62.1 years (range, 42 - 82 years). The extent of the GGO of nodule was classified into grade 1 (≤50%), grade 2 (50-90%), and grade 3 (≥90%) according to tumor disappearance rate (TDR %) in section with maximal diameter of the nodule on HRCT. TDR % was defined as [1 - (maximal diameter×perpendicular diameter on mediastinal windows/maximal diameter×perpendicular diameter on lung windows)] ×100. One pathologist retrospectively reviewed the extent of area of BAC classified into grade 1 (≤50%), grade 2 (50-90%), and grade 3 (≥90%) without knowledge of CT results on representative section of pathologic slide. When there is discrepancy the grade between CT and pathologic slide, slides were reviewed further evaluation of other histologic findings in BAC area.

Results: The relationship between TDR and Histologic BAC% was given in Table 1.

Table 1: BAC % correlated with TDR (p<0.0001, Kruskal-Wallis test)

BAC%/TDR%	1	2	3	Total
1	27	2		31
2	14	4		18
3	6 (2)*	4 (2)*	9 (4)*	19
Total	47	4	9	66

* numbers in parenthesis are pure BAC.HRCT underestimated BAC component in 24 cases and overestimated in two cases. The histologic components producing underestimation of BAC component were lymphocytic infiltration with or without intraalveolar macrophage (n=8), Aleolar collapse (n=6), mucin in alveolar space (n=4) and intraalveolar macrophage (n=3), etc. Overestimation of BAC component was related to intratumoral lucencies in two cases.

Conclusion: BAC % was correlated with ground-glass opacity area on HRCT. BAC component did not always appear as ground-glass opacity on HRCT. Underestimation of BAC component on HRCT was related to lymphocytic infiltration in interstitium, intraalveolar macrophage and mucin in alveolar space and alveolar collapse.