Conclusions: Serial respiration-correlated CT scans revealed important information on dosimetric consequences of anatomical changes during treatment. Preliminary data showed that variations in target and normal tissue volumes were small in average. Nevertheless, greater changes were observed in certain patients with larger tumor motion and in lower lobe lesions; therefore, effort to include image-guidance for setup and frequent imaging during the course of treatment, should be studied further.

PDS-1-4 Technical Advances on Radiation Therapy, Thu, 12:30 - 14:15

Differences in pattern of practice in radiation therapy for patients with non-small cell lung cancer between physicians from the United States and Other Countries

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Purpose: It is challenging to integrate the emerging radiation technology and evidences into daily practice. Physicians may differ in their treatment decisions due to various considerations. The purpose of this study is to determine whether there is a significant difference in practicing radiation therapy (RT) for non-small cell lung cancer (NSCLC) between radiation oncologists from the United States (US) and other countries.

Methods: Study questionnaires were designed by a panel of 8 American Board certified radiation oncologists. The survey was sent through email to radiation oncologist members of American Society of Therapeutic Radiology and Oncology (ASTRO) on September 10th, 2006, with the results collected online on March 14th, 2007. There were a total of 796 responses; 705 of them were considered to be valid for this analysis. Chi-square tests were used to test for associations between country and practice patterns.

Results: The respondents saw an average of 8 new cases monthly (range 0-25). There were 425 responses from the US and 280 from other countries. There was no significant difference in choices of radiation regimen for stage I peripherally located disease: 34% vs 26%, 10% vs 15%, and 19% vs 24%, for conventional fractionated, hypofractioned, stereotactic RT and stereotactic radiation therapy, for US and non-US physicians, respectively. For stage I centrally located disease, the majority of respondents selected fractionated radiation therapy; there was no significant difference between these two groups regarding the choice of fractionated (79% of US vs 73%) vs stereotactic RT (11% vs 12%). The choices of fractionation scheme for stereotactic RT included 18-20Gy×3, 15-17Gy×3, 8-11Gy×5, and 10Gy×6; more physicians were found to select 18-20Gy×3 from the US (14.3%) than from other countries (5.3%, p<0.001). For stage II and III, the dominant pattern of practice was concurrent chemoradiation; there were more respondents from the US (85%) that chose concurrent chemoradiation than from other countries (60% and 63% for stage II and III, p<0.001). Regarding choices of dose fractionation, the majority of respondents (91% of US vs 86% for US and non-US respectively) selected 60-70 Gy in 1.8-2 Gy daily fractions when radiation was combined with chemotherapy. More US respondents selected >70 Gy radiation (10% vs 3.6%, p=0.085). For stage IV disease, dose prescriptions ranged from from 0 Gy, 2.5Gy×20, 3Gy×15, 3Gy×10, to 2Gy×30 in 25% vs 27%, 18% vs 5%, 7% vs 8%, 13% vs 13%, and 27% vs 21% for US and non-US respondents, respectively. There were significantly more US respondents (P<0.001) that selected 50 Gy in 20 fractions.

Conclusions: Although the dominant practice patterns are similar in many settings, more US physicians selected larger fraction size for stereotactic RT, higher total dose for fractionated RT, and more concurrent chemoradiation for stage II/III NSCLC. The potential reasons for and societal impacts of these differences should be addressed.

PDS-1-5 Technical Advances on Radiation Therapy, Thu, 12:30 - 14:15

Radiation-induced elevation in plasma TGF-beta1 during radiation therapy may be predictive of radiation-induced lung toxicity in patients with non-small cell lung cancer: A combined analysis from Beijing and Michigan

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Background: It has been reported that plasma TGF-β1 at the end of radiation therapy (RT) in lung cancer was predictive of RILT. However, end of treatment evaluations cannot be used to adjust initial RT. The purpose of this international study was to investigate whether circulating TGF-β1 during RT correlates with RILT so that remaining RT could be adapted according to the risk of toxicity.

Methods: Patients were from two institutions: University of Michigan Hospital (UM) and Cancer Hospital of Peking Union Medical College and Chinese Academy of Medical Science (PUMC). Patients with stage I-III non-small cell lung cancer treated with fractionated RT were eligible for this study. Platelet poor plasma was obtained pre-RT and at 4 weeks (40-50 Gy) during-RT. TGF-β1 was measured using an enzyme-linked immunosorbent assay. The primary endpoint for RILT was ≥ grade 2 radiation pneumonitis or fibrosis. Radiation-induced pulmonary function reduction was assessed by measuring forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), and difusing capacity for carbon monoxide (DLCO) before RT and at three months after RT. Logistic regression and Chi-square were used for statistical analysis.

Results: Sixty-four patients with a minimum follow-up of 12 months were included. Twenty six were from UM and 38 were from PUMC. Fifty-seven were male and seven were female. The median age was 60 years. Fifty received chemotherapy concurrently (54.7%) or sequentially (23.4%) with RT. The median radiation dose was 63.9 Gy and the median mean lung dose (MLD) was 15.7 Gy. Three months after RT, DLCO declined to 54.8 ± 17.3% from a pre-RT level of 64.03 ± 17.9%, without a significant reduction in FVC and FEV1. Eighteen patients (28.1%) experienced ≥ grade 2 RILT. No significant difference in MLD was found between patients with RILT and those without RILT. When age, gender, disease stage, administration of chemotherapy, radiation dose, MLD, pre-RT FVC, pre-RT FEV1, pre-RT DLCO, pre-RT TGF-β1, during-RT TGF-β1, and TGF-β1 ratio (during-RT/pre-RT) were input into a logistic regression model, TGF-β1 ratio was the only
factor that significantly correlated with the risk of RILT (P = 0.035, OR = 2.354). If patients were grouped based on high or low TGF-β1 ratio (during RT/pre-RT), 13 out of the 29 patients with a TGF-β1 ratio higher than the median level of 0.8 developed RILT, while only 5 out of the 35 patients with low TGF-β1 ratios developed RILT (P = 0.007). No significant correlation was seen between TGF-β1 ratio and MLD or between TGF-β1 ratio and the decline in DLCO

**Conclusion:** An increase in plasma TGF-β1 level during RT may be predictive of RILT. The potential use of TGF-β1 levels during RT to adapt RT delivery deserves further study.

**PDS-1-6 Technical Advances on Radiation Therapy, Thu, 12:30 - 14:15**

**Combination of serum cytokine with lung DVH for prediction radiation pneumonitis**

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**Objective:** To study the relationship between level of plasma transform growth factor beta (TGF-beta), interleukin (IL-6), angiotensin-converting enzyme (ACE) and physical parameters (V10, V15, V20, MLD) and radiation pneumonitis (RP).

**Methods:** The records of all patients with lung cancer treated with radiotherapy (RT) with curative intent from February 2004 to August 2005. A total of 67 patients were identified who met the following inclusion criteria: (1) newly diagnosed lung cancer of any histology treated with RT± chemotherapy with curative intent; (2) a Karnofsky performance status >70; (3) expected survival >6 months; (4) follow-up time more than 6 months; (5) no pneumonectomy. Blood samples were collected and measured with enzyme-linked immunosorbent assay (ELISA). TGF-beta, IL-6 and ACE measurements obtained before RT (Pre-RT) and when RT dose reached 40-50Gy (during-RT). Fifty-eight patients were treated with computed tomography based 3-dimensional planning and had dose-volume histogram data available. The endpoint of the study was the development of ≥ grade 2 RP (NCI [National Cancer Institute] common toxicity criteria 3.0).

**Results:** The Median follow-up time of the alive patients is 22.6 months. The incidence of ≥ grade 2 RP for all 67 patients was 25.4%. Between the RP and non-RP group, there was no difference in Pre- or during-RT level of TGF-beta, IL-6. We observed ACE level was lower in RP group than in the non-RP group, both pre-RT and during-RT (p=0.033 and p=0.004). Fifty-eight patients received 3-dimensional conformal RT (3DCRT). In RP group, patients are received higher all lung V10, contra lateral MLD, contra lateral V10, contra lateral V15, contra lateral V20 (44% vs 39%, 1931cGy vs 990cGy, 52% vs 35%, 48% vs 27%, 37% vs 10% P< 0.05). The subgroup of 54 patients treated with 3DCRT and the data of ACE level were available, were divided into groups according to their plasma ACE median level and whether their V10 level was above or below the median of 40%; Group I (n=13), with ACE > 506ng/ml and V10 ≤ 40%; Group II (n=30), with ACE > 506ng/ml and V10 > 40%; ACE ≤ 506ng/ml and V10 ≤ 40%; Group III (n=12), with ACE ≤506ng/ml and V10 > 40%. A significant different was found in the incidence of RP among these three groups (0%, 26.7%, 50.0% p=0.008)

**Conclusions:** (1) A lower plasma ACE level during-RT is an independent risk factor for RP; (2) The combination of plasma ACE level and V10 appears to facilitate stratification of patients into three groups. Thus, combining both physical and biologic risk factors may allow for better identification of patients at risk for the development of symptomatic radiation-induced lung pneumonitis.

**PDS-1-7 Technical Advances on Radiation Therapy, Thu, 12:30 - 14:15**

**Time trends in nodal CT volume and nodal motion during radiotherapy for patients with stage III non-small cell lung cancer**

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**Background:** Knowledge of changes in volume and motion of either tumor or involved lymph nodes during a course of radiotherapy is necessary to improve the treatment (adaptive radiotherapy). These changes for the primary tumor were already reported (Bosmans et al, Int J Radiat Oncol Biol Phys, 2006). The purpose of this study is describing the time trends in nodal CT volume and nodal motion, for patients with locally advanced non-small cell lung cancer.

**Methods:** Eleven patients, with a total of 21 nodes, from a prospective clinical trial underwent CT-PET scans prior to treatment, which was repeated in the first and second week following the start of radiotherapy. For 20 nodes, the motion could be measured based on a respiration correlated CT (RCCT) scan. Moreover, repeated RCCT scans were available for 11 nodes to evaluate the change in motion. Patients were treated with an accelerated fractionation schedule, 1.8 Gy BID, with a total tumor dose depending on pre-set dose constraints for the lungs and the spinal cord.

**Results:** A heterogeneity of nodal volume changes was observed at all time points similar to the tumor volume changes. In some patients the nodal volume increased > 50% (4/21) in others the volume decreased > 50% (1/21) but for the majority of nodal areas (16/21) the volume only changed slightly (< 50%). The initial absolute nodal volume was 4.5 cc ± 4.3 cc, therefore large volume changes were observed and the delineation of small volumes is sensitive to intra-observer variability. On average the nodal volume did not change significantly (4.5, 4.9 and 4.3 cc prior to treatment, 1 and 2 weeks after the start of treatment respectively). The 3D vector motion, which is the quadratic sum of the