9050 POSTER

Predictors of Radiation Pneumonitis and Associated Changes in Pulmonary Function After Definitive Concurrent Chemoradiotherapy for Non-small Cell Lung Cancer

Y.H. Park[1], J.S. Kim[2]. [1]*Seoul National University Hospital, Radiation Oncology, Seoul,* [2]*Seoul National University Bundang Hospital, Radiation Oncology, Seoul, South Korea*

Purpose: To evaluate the predictive factors of radiation pneumonitis (RP) and associated changes in pulmonary function after definitive concurrent chemoradiotherapy (CCRT) in patients with non-small cell lung cancer (NSCLC).
Materials and Methods: Medical records of 61 patients with NSCLC who received definitive CCRT at Seoul National University Bundang Hospital were retrospectively reviewed. Dose volumetric parameters, clinical factors, pulmonary function test (PFT) data were analyzed. Radiation pneumonitis was graded according to the CTCAE v3.0. Percentage of lung volume that received a dose of 10 Gy or more (V10), 20 Gy or more (V20), 30 Gy or more (V30), mean lung dose (MLD) were analyzed for potential dose volumetric (DV) predictors. PFT changes were calculated as the difference between pre-RT and post-RT values at 3, 6, 12 months after RT. Tumour location was categorized into two groups, upper (including middle) and lower lobes.
Results: The median overall and progression-free survival time were 21.9 month and 10.6 months. Twenty-three patients (38%) developed grade$\geqslant$2 RP. Among clinical factors, underlying chronic obstructive pulmonary disease was associated with RP ($p = 0.050$) but not with grade$\geqslant$2 RP ($p = 0.871$). Tumour located at lower lobe was associated with grade$\geqslant$2 RP ($p = 0.002$). Among the DV parameters, only MLD >15 Gy was associated with grade$\geqslant$2 RP ($p = 0.007$). There were statistically significant decreases in PFT values at all points compared with pre-RT values. MLD was associated with FVC changes at 6/12 months ($p = 0.006/0.016$) and FEV1 changes at 6 months ($p = 0.005$). V10 and V20 were associated with FVC changes at 12 months ($p = 0.048/0.025$) and V30 was associated with DLCO changes at 12 months ($p = 0.009$).
Conclusions: After definitive CCRT in patients with NSCLC, MLD >15 Gy and lower lobe tumour location were predictors of grade$\geqslant$2 RP. Pulmonary functions were decreased after CCRT and the magnitude of changes was associated with DV parameters.

9051 POSTER

The Study of the Accumulated Dose for Healthy Tissue and Organs at Risk in Different Plans Based-on Deformable Registration in Lung Cancers

C. Ma[1]. [1]*Shandong Tumour Hospital, Radiation Oncology Physics, Jinan Shandong, China*

Purpose: To eveluate the accumulated dose and volume of healthy tissue in different plans on different CT images applying deformable registration for lung cancer patients and compare the dosimetry with static plan.
Methods: Ten 3D-CRT and IMRT lung cancer plans were analysed retropectly. During the radiotherapy period the patients had another CT scanning and replan by the total prescribed dose. The accumulated dose produced in new CT image contours deformed the old CT image dose. The accumulated organs at risk (OAR) dose on new CT image contours were compared with static plan dose for left lung, right lung, total lung, heart and spinal-cord in a statistical methed.
Results: The volume of V5 in left lung, right lung and total lung in static plan were all lower than the deformable accumulated dose volume($P > 0.05$). The maximum difference was 3.38% in V5 of left lung($P > 0.05$). The volume of V10 in static plan was all lower than the deformable accumulated dose volume($P > 0.05$). The volume of V15 in static plan was all higher than the deformable accumulated dose volume($P > 0.05$). The volume of V20, V25and V30 in all lungs the plan dose volume were all lower than the deformable accumulated dose volume($P > 0.05$). The mean dose of the left, right and total lung for the static plan dose was higher than the deformable accumulated dose and there was significance in statistics in right lung mean dose($t = 5.461, P = 0.012$). The volume of V30 and V40 in heart the static plan dose volume was lower than the deformable accumulated dose volume($P > 0.05$). The maximum dose of spinal-cord in static plan was higher than the deformable accumulated dose($P > 0.05$).
Conclusion: No statistical significances were obseved between static plan and deformalbe method for healthy tissue and OARs but the mean dose of right lung with significance. The result preliminary investigated the plan dose could be used to evaluate the dose and volume parameters for lung and heart in lung cancers. We need deformable registration to cauculate the DVH parameters. However, we needed more patients to further study to get the more accurate result.

9052 POSTER

Volumetric Differences in Clinical Target Volume (CTV) Vs Internal Target Volume (ITV) in Lung Cancer Radiotherapy

J.L. Monroy Anton[1], M. Lopez-Muñoz[1], M. Soler Tortosa[1], F. Candela Rodriguez[1], M. Melchor Iñiguez[1]. [1]*Hospital Universitario la Ribera, Radiation Oncology, Alzira (Valencia), Spain*

Background: In the radiation treatment of lung cancer, the physiological breathing produces position changes in tumours that can drag losses geographical part of the target if designed treatment volumes do not take account of these movements. Technological advances make it possible to solve these problems, but centers which do not have such progress must devise systems and techniques to obtain information about these changes of position. The design of an Internal Target Volume (ITV) takes into account the movements of the target.
The purpose of our study is to evaluate the volumetric differences between the design of a Clinical Target Volume obtained with a single CT study (CTVn), versus ITV obtained by means of the technique of CT-fusion in different phases of the respiratory cycle.
Materials and Methods: Prospectively analyzed a group of 10 patients with lung cancer and submitted to receive 3D conformal radiotherapy.
Simulation was carried out with a set of three CT studies at different times of the respiratory cycle: physiological breathing, inspiration enforced, expiration enforced. These studies were merged for the design of three CTV: physiological breathing, CTVn; inspiration: CTVi; expiratory: CTVe.
One ITV was designed from the three CTV obtained in each phase of the cycle. The PTV was obtained by adding a margin of 0.7 cm to the ITV volumes. Data analysis focused on the volumes CTVn and ITV.
Results: The 10 cases completed the process of simulation and design of volumes. The assessment of the increase in volume between CTVn vs ITV was obtained applying the formula:
[(ITV vol) − (CTVn vol)]/(CTVn vol)
The average relative increase was approximately 65% of the volume designed as CTVn (range: 7–156%). Most of the cases were in increments between 20 and 60% of the volume.
The ratio between the ITV and CTVn volumes [ITV/CTVn] ranged from 1.07 to 2.56. The mean of this ratio was 1.65.
Conclusion: The design of ITV with three CT-fusion technique at different phases of the respiratory cycle results in an increase in volume with respect to the design of a CTV with a single CT during the physiological breathing. This increase is due to the registration of changes of target volume position with respiration.
The design methodology of ITV with CT in different phases of the respiratory cycle yields larger volumes, but ensures coverage of the target taking into account the position changes during this cycle. This technique can be used in institutions with 3D conformal radiotherapy, and which do not have advanced technology.

9053 POSTER

Which is the Optimal Biologically Effective Dose of Stereotactic Body Radiotherapy for Stage I Non-small-cell Lung Cancer?

B. Li[1], J. Zhang[1], F. Yang[1], H. Li[1], J. Liu[2]. [1]*Shandong Tumour Hospital, Radiation Oncology, Jinan Shandong,* [2]*Shandong University, School of Public Health, Jinan Shandong, China*

Background: To assess the relationship between biologically effective dose (BED) and efficacy of stereotactic body radiation (SBRT) and to explore the optimal BED range for stage I non-small-cell lung cancer (NSCLC).
Methods and Materials: Eligible studies were identified on Medline, Embase, the Cochrane Library and the proceedings of annual meetings through June 2010. According to the quartile of included studies, BED was divided into four dose groups: low (<83.2 Gy), medium (83.2–106 Gy), medium-high (106–146 Gy), high (>146 Gy). To obtain pooled estimates of overall survival (OS), cancer-specific survival (CSS) and local control rate (LCR), data were combined in a random effect model. Pooled estimates were corrected for the percentage of small tumours (<3 cm).
Results: Thirty-four observational studies with a total of 2,587 patients were included in the meta-analysis. Corrected pooled estimates of 2- or 3-year OS in medium BED (76.1%, 63.5%) or medium-high BED (68.3%, 63.2%) groups were higher than that in low (62.3%,51.9%) or high groups (55.9%, 49.5%), respectively ($P \leqslant 0.004$). Corrected 3-year CSS in medium (79.5%), medium-high (80.6%) and high groups (90.0%) were higher than that in low group (70.1%; $P = 0.016$, 0.018, 0.001, respectively).
Conclusion: OS for the medium or medium-high BED groups were higher than those for the low or high BED group for SBRT in stage I NSCLC. The medium or medium-high BED (range, 83.2–146 Gy) for SBRT may currently be more beneficial and reasonable in stage I NSCLC.