pulmonary complications in according to the Radiation Therapy Oncology Group toxicity criteria.

Conclusions: Our preliminary data suggested that radical treatment with SBRT is safe, feasible and provides a chance for long-term survival by offering favourable local control. 4D CT/PET planning and daily MV-CD evaluation are effective in target repositional accuracy for lung SBRT.

EP-1121

Volumetric Modulated Arc Therapy Radiosurgery for liver metastases: feasibility and early clinical experience

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Purpose/Objective: Radiosurgery is an emerging radiation technique for the treatment of liver metastases, with encouraging local control rates and the ability to spare normal liver tissue radiation toxicity. The aim of this study was to demonstrate the feasibility of linac-based radiosurgery for liver metastases in terms of plan quality, dosimetric accuracy and treatment efficiency. In addition, the early clinical results are reported.

Materials and Methods: Nine patients with liver lesions, enrolled in a prospective dose escalation study, were treated using Volumetric Modulated Arc Therapy. Patients immobilization was performed by means of the stereotactic body frame (SBF, Elekta, Crawley, UK). Clinical volumes were defined on CT-scans, PET/CT and MRI. The CTV was defined as the GTV. The PTV was individually defined for each patient based on Internal Margin (IM) and Set-up Margin (SM) assessment. The SM was set at 3 mm. OARs were the normal liver (liver minus CTV), spinal cord, esophagus, stomach, duodenum, small bowel and kidneys. Plans were generated with Elekta ERGO++ TPS, with a single arc rotation, using pencil beam algorithm with inhomogeneity correction for dose calculation. All patients were accrued at 26 Gy single fraction dose prescription. The prescription isodose surface (IDS) was selected as the greatest IDS fulfilling the two following criteria: 95% of PTV reached 100% of the prescription dose and 99% of PTV reached a minimum of 90% of prescription dose. Constraints for OARs were: healthy liver (700 cc < 15 Gy; V_{7Gy}<50% and V_{12Gy}<30%); stomach and duodenum (D_{max}<12.4 Gy); spinal cord (D_{max}<14 Gy); kidneys ($V_{10.6Gy}$<2/3) and heart (D_{max}<22Gy). Plans quality was evaluated by conformity index (CI), conformation number (CN) and gradient index (GI). VMAT delivery parameters were recorded in terms of MUs and beam-in time. All plans underwent dosimetric verification by means of ion-chambers array, using absolute doses and gamma analysis.

Results: Median PTV was 54.7 cc (range:14.6-102.9 cc). The dose-volume constraints for OARs were observed in all patients. Median CI, CN and GI were 1.23 (range: 1.16-1.50), 0.81 (range: 0.66-0.87) and 3.6 (range: 2.6-4.3), respectively. The median beam-on time and MU number were 8.1 min (range:7.6-8.5 min) and 3010 MUs (range: 2789-3148 MUs), respectively. More than 95% of points passed the γ-test for every arc (coronal and sagittal planes) with criteria of 3%-3mm. Overall treatment was well tolerated with no radiation induced liver disease and dose limiting toxicity. 1 patients had acute toxicity grade 1. At median follow-up of 9 months, 6 patients had complete remission, 3 partial remission and 0 local progression.

Conclusions: Linac-based radiosurgery is a feasible, safe and effective modality to treat liver metastases supplying high plan quality and extreme clinical efficiency. Single fraction radiosurgery provides excellent local control with minimal side effects in patients with limited hepatic metastases.

EP-1122

Use of a dynamic thorax phantom for radiation dose determination of a floating target in Extracranial Stereotactic RT

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Purpose/Objective: Target determination is a basic requirement in radiotherapy. Especially for thoracic targets, respiratory and cardiac motion has great influence on the irradiation plan. The idea of this work was to use motion information derived from gated PET/CT images to create a more appropriate irradiation plan. To validate this method a thorax phantom was developed, which is compatible with MRT, CT and PET.

Materials and Methods: The thorax phantom includes organ compartments (lungs,heart, diaphragm), which are able to represent realistic respiratory and cardiac motion. A small source, filled with radioactivity, was attached to the diaphragm to simulate a lesion, which is moved identifiable in CT/MRT/PET. By using image-derived motion information from 4D PET and CT (at mid- and end-respiratory phases) acquisitions different irradiation plans were calculated with Eclipse TPS. During radiation, an ionization chamber was placed at the same position as the small source. The measured dose of the ionization chamber was compared to the calculated dose of the irradiation plan.

Results: First tests showed the applicability of the proposed designs. The presence of the ionization chamber did not interfere with respiratory and cardiac motion. Using this setup, it is possible to examine various methods based on PET, CT and MRT information considering various types of lesion movement during radiation. First measurements showed a deviation of up to 3% between the measured and calculated dose by using 4D PET/CT information.

Conclusions: Using the proposed thorax phantom setup, a quantitative simulation of image-based radiotherapy treatment has been successfully performed. The method is especially appropriative for Extracranial Stereotactic Radiotherapy by using 4D PET/CT information.

EP-1123

Evaluation of the accuracy of the GTC headframe on tomotherapy-based stereotactic radiotherapy system

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Purpose/Objective: The purpose was to evaluate the setup accuracy of the GTC headframe in 3D aspects from matching results between the planning CT and the pre-treatment MVCT of tomotherapy.

Materials and Methods: 15 patients treated with the GTC headframe by tomotherapy-based stereotactic radiotherapy (Tomo-SRT) system. 8 were treated by single-fraction radiosurgery while 7 were treated with fractionated radiotherapy. There were 50 sets of set-up data in the study.

The planning CT was done with an N-shaped CT localizer & 0.625mm slice thickness. The pre-treatment MVCT was scanned with the N-shaped CT localizer and fused with the planning CT images. Anatomical match was done with 'Bone technique registration', 'Super Fine Resolution' and 'Translation & Roll correction'. The online anatomical match result represented overall set-up error. The offline rod matching result by matching the rods of the N-shaped CT localizer in both planning CT and pre-treatment MVCT was taken as the 'perfect match', which would represent the intrinsic systematic error. The true set-up error would be as follows:

True set-up error = Online anatomical match result - Offline rod matching result

Similar matching methods were repeated, except the correction method was changed to be 'Translation + Pitch + Roll + Yaw', to simulate 'Ideal SRT' if a 6-degree couch was available.

The matching results were recorded. The mean and standard deviation were calculated.

Results: In Table 1, the mean values of all directions and rotations in both online & offline matching were within the tolerance of stereotactic radiotherapy (SRT), i.e. ±1mm & ±1°, except in the vertical direction. However, the true set-up error was all within the tolerance.