Most of the patients have been treated for acute leukemia with allogeneic transplant.

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Sparing potential of scanned protons for the treatment of intramammary nodes in breast radiotherapy

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Purpose or Objective: Breast cancer patients are among the long-term survivors of radiotherapy and therefore the long-term cardiopulmonary toxicity due to the treatment should be reduced to a minimum. However, complication rates could be further increased when intramammary nodes are included in the target due to their proximity to the heart and the lungs. Several techniques could be used to decrease the dose to the normal tissues and consequently the rates of late complications, including proton beam radiotherapy and respiratory gating. This study aims to investigate the potential for normal tissue sparing for the treatment of intramammary nodes in breast cancer radiotherapy using scanned proton beams with or without respiratory gating.

Material and Methods: The study was performed on CT-datasets acquired from ten left-sided patients during enhanced inspiration gating (EIG) and free-breathing (FB). The patients were planned with intensity modulated proton therapy (IMPT) for locoregional breast treatment. The prescribed dose to the target was 50 GyRBE in 25 fractions, assuming an RBE of 1.1. Different plans were performed for breast and supraclavicular nodes respectively breast, supraclavicular and intramammary nodes (IMN). The implications of including IMN in the target volume were evaluated from the point of view of the doses to the organs at risk for cardiopulmonary complications.

Results: Inclusion of the IMN in the target volume led to a small increase of the cardiopulmonary burden. Thus, in FB cases the average dose to the heart increased from 0.3 to 0.4 GyRBE and the average dose to the lung increased from 6.1 to 6.6 GyRBE, while the average dose to the left anterior descending artery (LAD) decreased from 4.1 to 3.8 GyRBE. For EIG cases the average dose to the heart was almost unchanged (0.2 GyRBE), the average dose to the lung increased from 6.9 to 7.4 GyRBE and the average dose to the LAD decreased from 3.3 to 2.6 GyRBE. Other dosimetric parameters of interest showed a similar trend when IMN were included in the target. These parameters are much lower than those that could be achieved in conventional radiotherapy with photons, especially with respect to the cardiovascular burden, irrespective of whether respiratory gating is used or not.

Conclusion: The results of this study indicate that radiotherapy with scanned proton beams has the potential of significantly limit the cardiopulmonary burden compared to photon RT when including the IMN in breast cancer radiotherapy.

EP-1677

Comparison of different techniques in lung SABR using VMAT with deep inspiration breath hold

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Purpose or Objective: Stereotactic ablative radiotherapy (SABR) for the lung primary and metastatic tumors aims to increase the local control, survival and quality of life. Deep inspiration breath hold (DIBH) using 4D CT for simulation minimizes respiratory motion and reduces the toxicity risk by decreasing margins. In this study, we aimed to compare the dosimetric results of different devices and techniques of SABR using volumetric arc therapy (VMAT) with DIBH in the lung tumors.

Material and Methods: CT datasets of 7 patients with right-sided lung cancer performed with RPM system (Varian, Palo Alto) was used. Median PTV was 13.2cc. Dose prescription objective was to cover 98% of the target volume by D98% which was 50 Gy/5 fractions. Four different VMAT plans were made on Eclipse TPS (Varian, Palo Alto) using AAA algorithm. Plan A consisted of TrueBeam,120HDMLC, 6MV-FFF, without jaw tracking, Plan B TrueBeam,120HDMLC, 6MV-FFF, with jaw tracking, Plan C TrueBeam,120HDMLC, 6MV, without jaw tracking, Plan D with Trilogy, 120MilleniumMLC, 6MV, without jaw tracking. Three partial arcs using 210 degrees were used to generate the plans under the same optimization conditions. Monitor Unit (MU), beam-on time (BOT), Gradient Index (GI), lung V20 and V5, dose at 2 cm from PTV (D2cm), PTV(Dmax) and PTV(Dmin) were assessed for comparison. Wilcoxon test was used for statistical evaluation.

Results: No statistically significant differences were found for total MU, D2cm and PTV(Dmin) between the four plans. Mean PTV(Dmax) values were lower in Plan C with HDMLC compared to Plan D with MilleniumMLC (122.9%±3.9 vs 126.8%±3.7, p=.018). At GI assessment; there was no significant difference between plans with and without jaw-tracking. However, there was a significant difference between Plan C and Plan D (4.4±0.5 vs 4.8±0.6, p=.018); and between Plan A (FFF) and Plan C (FF) (4.2±0.4 vs 4.4±0.5, p=.018). V20 and V5 was lower in Plan C compared to Plan D (2.8%±1.5 vs 3.3%±1.5, p=.028 and 15.1%±5.3 vs 16.0%±5.6, p=.018).; V5 was lower in Plan A compared to Plan C (14.4%±5.1% vs 15.1%±5.3). BOT was significantly shorter between Plan A and Plan C (167.5 sec±20.4 vs 390.5 sec±47.8, p=.018).

Conclusion: In SABR with WMAT using DIBH, we observed some improvements by using HDMLC compared to MilleniumMLC and FFF compared to FF beams. However, we could not observe additional benefit with jaw tracking in the FFF mode. Major advantage of FFF was the shorter BOT, which may finally improve the patient compliance in SABR using DIBH technique.

EP-1678

VMAT in locally advanced lung cancer; does it add benefit?

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Purpose or Objective: In locally advanced NSCLC Concurrent chemo/Radiation is the key most important treatment approach. However delivering adequate radiation dose to improve treatment results is limited by the tolerance of nearby structures (lungs, esophagus, heart etc…), and by the intrafractional uncertainties resulting from prolonged treatment time of the conventional techniques. We have compared VMATplanes Vs. 3D CRT in inoperable advanced lung cancer cases.

Material and Methods: Ten cases of previously treated lung cancer with 3DCRT planes (minimum of 4 beams) were replanned with VMAT optimization using 2 half arcs. Both planes were performed on Eclipse© planning system (version 11) with AAA-algorithm and linear accelerator UNIQUE © of energy 6Mv , dose rate of 600 cGy/min , and 120 multileaf collimator. The dose was prescribed as 60Gy / 30fr to the CTV surrounded with margin of 1.5cm for the PTV. Plans were compared for coverage , avoidance of organs at risk , and total number of MU.