0.5-0.6 in order to keep the skin dose similar to those from the conventional plan. Breast gating treatment minimizes the skin dose variation.

SU-FF-T-417

The Effect of Target Volume Depth On Surface Dose for Inverse Planned IMRT Treatments of Head and Neck Cancers

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Introduction: This work evaluates the surface dose as a function of PTV proximity to the surface for inverse planned head-and-neck IMRT patients and compares the results to measurements performed for a conventional treatment technique. Methods and Materials: An anthropomorphic phantom was CT scanned in the supine treatment position with thermoplastic mask immobilization covering the entire head-and-neck excluding the supra-clavicular region. A CTV including the cervical, low neck, and supra-clavicular lymph nodes, as well a 5 mm margin was outlined. Inverse IMRT plans were generated using a 7 field coplanar technique with 6 MV photons. Plans were created for PTVs defined at 0, 5, and, 10 mm depth from the phantom surface (PTV_{skin}, PTV_5, PTV_{10}). The treatments were delivered using a dynamic multileaf collimator sliding window technique. Measurements at up to 8 locations on the surface of the phantom and at 2 locations near the center of the PTVs were performed using TLD and MOSFET dosimeters. Results were compared to measurements performed for a conventional 3-field geometry (opposed laterals and anterior supra-clavicular field planned to cover the PTV_{skin}). **Results: and Discussion:** The average surface dose for the IMRT plans in the neck region was measured to be 59%, 78%, and 92% of the prescription dose for the PTV_{10}, PTV_5, and PTV_{skin} plans respectively, and likewise, 53%, 55%, and 73%, respectively in the supra-clavicular region. Average surface doses from the conventional field arrangement were measured to be 100% and 36% of the prescription dose for the neck and supra-clavicular region respectively. **Conclusion:** For the IMRT plans the surface dose increased as a function of the PTV proximity to the surface. For an equivalent prescription dose, the conventional 3-field technique yielded a higher average skin dose in the neck region and lower dose in the supra-clavicular region in comparison with the IMRT plans.

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The Effect of Total MU, Number of Segments, and Field Size On IMRT Point Dose QA Results

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Purpose: To investigate the relationship between Corvus IMRT treatment plan parameters (total MU, number of segments, and average field size) and point dose QA results (ion chamber measurements and RadCalc independent MU calculation software). **Method and Materials:**
The Corvus treatment planing system (TPS) employs a "calibration factor" in its dose calculations. We determined this factor using a set of test plans with an average of 555 MU, 220 segments, and 7.3x7.3cm2 equivalent square field size. The TPS was then used to calculate 95 patient plans. Hybrid plans were created by transferring patient plans to a 30x30x18 cm3 solid phantom. A 0.3cc ion chamber and Kodak EDR2 film were placed inside the phantom. The treatment fields were delivered on a Varian 21EX via the QA Mode of Impac Multi-Access R&V system. For each plan, dose to the isocenter was calculated with RadCalc and compared to the plan's prediction. Ion chamber and RadCalc percent error values versus total MU, number of segments, and field size are plotted and analyzed with the Pearson's product moment correlation coefficient. **Results:** The data indicate that for this equipment configuration, both ion chamber measurement and independent calculation percent error results are directly proportional to total MU, number of segments, and average field size. In general, RadCalc predicts a smaller percent error than ion chamber measurements for all three variables. For ion chamber measurement, field size produces the strongest positive correlation with percent error and MU the weakest. For RadCalc percent error, number of segments produces the strongest correlation and field size the weakest. **Conclusion:** For the Corvus TPS, the measured dose percent error increases as the total MU, number of segments, and field size increases beyond the average value used to determine the calibration factor. RadCalc independent MU calculation software predicts the same trend.

SU-FF-T-419

The Impact of Gating On the Reduction of Heart Doses for Left Sided Breast Cancer Irradiation

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Purpose: Because there are indications for an increased risk of cardiovascular diseases after radiotherapy of the left chest wall the dose to the heart should be reduced as far as possible. With respiratory gating technique irradiation can be restricted only to the inspiratory plateau phase. We investigated in all patients with left sided breast cancer dose reduction to the heart when treated only in the inspiration phase compared with not gated treatments. **Materials and Methods:** Between Sept 2004 and Feb 2006 107 patients with left sided breast cancer were treated with respiratory gating technique based on a retrospective 4D CT scan. We performed for all of these patients a normal and a respiratory gated planning CT. Planning was done with the same treatment parameters in both CT. DVH for the entire heart and the anterior left ventricle wall were calculated. All patients were treated with 2 Gy single dose to a total dose of 50 Gy to the entire left breast/chest wall. 68 patients received an additional boost of 10 Gy. **Results:** The mean dose to the entire heart was 0.7 Gy without and 0.6 Gy with respiratory gating (p=0.04) whereas the mean maximal dose was 40.2 Gy without and 11.7 Gy with respiratory gating (p=0.0003). The anterior heart wall receives 2.4 Gy without and 1.2 Gy with respiratory gating (p=0.0001) with a mean maximal dose of 39.6 Gy without and 10.1 Gy with respiratory gating (p=0.0004). **Conclusion:** 4D analysis has shown that the distance between the PTV and the heart is influenced by two separate parameters. Besides the movements of the chest wall the heart is pushed into the irradiated volume also by the diaphragm. Respiratory gating and irradiation only in the inspiratory phase significantly reduces radiation doses to the heart and especially to the anterior heart wall.

SU-FF-T-420

The Impact of Random and Systematic Errors of MLC Leaves On Head-And-Neck IMRT Plans

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Purpose: To investigate dosimetric effect of the random and systematic errors of MLC leaf positions on the IMRT plans for patients with head and neck cancer. **Method and Materials:** For six clinical IMRT plans, random errors (from -2 to 2 mm) and systematic errors (±0.5 mm and ±1 mm) MLC positioning errors were introduced into the each segment for these plans, simulating the mechanical uncertainties and potential mis-calibration of the MLC. The altered MLC segments for each plan were imported to a commercial treatment planning system to evaluate dosimetric changes of the plan. The altered plans were compared to the original plans, based on DVHs and defined endpoint doses. **Results:** With the up-to-2 mm random errors in MLC positions, the dose changes to the 95% of the tumor volumes were (-1.247± 1.153)%. For serial structures, the dose changes to the 0.1 cc of the brainstem and spinal cord were (0.230±0.794)% and (–0.340±1.254)%, respectively. The dose changes to the 50% of the parotids varied from patient to patient, from 0.536% to 11.333%, (1.641±4.274)% and (4.910±5.322)% overall. With systematic errors in MLC positions up to 1 mm, the dose changes to the 95% of the tumor volumes were (-0.078±1.048)%. The dose changes to the 0.1 cc of the brainstem and spinal cord for all patients except one were (0.591±1.058)%. The dose changes to the 50% of the parotids overall were (7.782±3.111)%, beyond 5% limit. **Conclusion:** The dosimetric changes introduced by the random errors for each leaf within 2mm were not significant compared to the original plans. The systematic error up to 1mm for each leaf did not significantly changed the target dose and the maximum doses to the serial structures while the doses changes to the parotid could be significant. **Conflict of Interest:** This project is partly funded by SIEMENS.

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The Influence of Field Length, Pitch, and Modulation Factor On the Quality of Helical Tomotherapy Plans

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Purpose: The planning process for helical tomotherapy plans is governed by three basic planning parameters: field length, pitch ratio, and