improvement in sparing of the critical structures for the 1-cm jaw width, the 2.5-cm jaw width, currently used in our clinic, remains our preference.

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SU-GG-T-478

Prostate IMRT Planning: Aperture Based Vs. Beamlet-Based

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Purpose: To compare Aperture-based (AB) and Beamlet-based (BB) inverse treatment plans for prostate cases. The plans are compared for total monitor units, number of segments, treatment time and plan quality. **Method and Materials:** Ten patients were planned using both Elekta PTI Precise and the CMS XIO planning systems. For the Precise system, the apertures used in the optimization process were determined a priori by considering target and critical structure anatomic geometry. The XIO system used the BB approach with segmentation software to establish final apertures. The same target and critical structure dose constraints were used for the inverse planning for both systems. Seven gantry angles were used for the AB plans, and both seven and five angles were used for the BB plans. The prescribed dose was normalized to provide coverage to 95% of the PTV. Patient records were reviewed to determine overall treatment time. **Results:** Plans were evaluated by comparing the achievement of IMRT constraints. No significant variation in plan quality was found for the two planning techniques. The average MUs for AB was 337(range of 302.1-374.5) compared to 386.8(317-491.4) for 5-field BB plans and 394.2(312.6-508) for 7-field BB plans. The average number of segments for AB was 47.6(37-56) compared to 61.4(36-79) for 5-field BB plans and 78.1(53-111) for 7field BB plans. The average treatment times were lower for the BB plans (10.66min) compared to (11.48min) AB plans. **Conclusion:** The quality of the AB plans compared favorably with the BB plans. The AB plans had a small advantage in both total MU and segments, while the BB plans delivered more quickly. This result may be due to degree of delivery automation for the BB approach. This work points to the possibility of exploiting the use of AB planning for adaptive treatment.

SU-GG-T-479

Dosimetric Comparison of Whole Breast Irradiation Using Helical Tomographic Technique and Static Multileaf Collimated Field-In-Field Technique

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Purpose: To review the dosimetry results of whole breast irradiation using a helical Tomotherapy Hi-Art device and discuss the feasibility of such treatment technique by comparing the data with linear accelerator based Eclipse field-in-field (FIF) technique. **Method and Materials:** Twenty breast plans were generated using a Tomotherapy Hi-Art planning system. Among them, 11 were left breast cases and 9 were right breast cases. Treatment planning techniques such as contour delineation and optimization strategy/parameters were described. Key dosimetric results including target dose coverage and organs-at-risk (OAR) dose statistics were compiled and presented. Radio-biological consequences to the OARs were studied using the normal tissue complication probability (NTCP) models. A retrospective study using the forward FIF planning technique was also performed for those 20 patients as comparison benchmark. **Results:** On the ipsilateral side, the Tomotherapy plans performed slightly better than the forward FIF plans in target coverage and dose uniformity (p=0.0018), and significantly better in OAR high dose statistics such as V20 in lung (p=0.0001) and V30 in heart (p=0.0003). Meanwhile, the Tomotherapy plans delivered slightly higher average dose to both ipsilateral and contralateral OAR, including the heart, the lung, the breast, the esophagus, and the spinal cord. However, the differences in NTCPs between the two techniques for the total lung (p=0.298) and the heart (p=0.268) were statistically insignificant, whereas the NTCPs for the esophagus were too low to compare. **Conclusion:** The Tomotherapy technique can provide better target coverage for breast cancer treatment. The differences in NTCPs associated with slightly higher mean doses to the OAR were insignificant comparing with the forward FIF technique.

SU-GG-T-480

Displacement of Implanted Gold Fiducials Due to Rectal Marker Placed for Delineating the Luminal Surface of Rectum

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Purpose: To evaluate the displacement of implanted gold fiducials secondary to the placement of a rectal marker to delineate the luminal surface of rectum**. Method and Materials:** Five prostate-cancer patients were scanned by using a CT scanner (Brilliance Big Bore, Philips) for planning purposes. CT images were acquired with a rectal marker (Intermark Inc., UK) and then followed by images without the marker. For all of the patients, two or three gold fiducials were implanted into the prostate for image-guided radiation treatment. Both CT images were fused and registered based on the bony structure and then the gold fiducials were contoured for evaluating the displacement due to the rectal marker. Displacements of gold fiducials with and without the rectal marker were computed. Also, displacements of gold fiducials against the isocenter as well as femoral head were computed for comparison. **Results:** Mean displacement of gold fiducials was less than 2.5 mm in all directions (lateral:0.12±0.15cm, vertical:0.21±0.29cm, longitudinal:0.14±0.27cm). However, the maximum displacement of fiducials in anterior-posterior and superior-inferior directions was approximately 3.5mm and all cases were skewed toward the anterior direction, demonstrating that the movement of gold fiducials due to a rectal marker was strongly related. Maximum change in distance between gold fiducials with and without the rectal marker was 0.12±0.13cm. In addition, maximum displacement between the gold fiducials and insocenter/femoral head with and without the rectal marker was 0.17±0.09cm for insocenter and 0.15±0.08cm for femoral head, respectively. This finding confirmed that the treatment margin of 5mm was adequate to cover the deformation of prostate as well as rectum caused by rectal marker insertion, especially in the anterior-posterior direction. **Conclusions:** Overall, the relative positions of gold fiducials were minimally changed with and without rectal marker. However, the rectal marker forced up the rectal wall and prostate anteriorly (mean:0.21±0.29cm) with maximum displacement of 3.5mm.

SU-GG-T-481

4D-CT What Is It Good For?

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Purpose: Retrospectively analyze a cohort of lung cancer patient's 4D simulation data and calculate the dosimetric impact of using a single respiratory phase CT image to design treatment fields. These fields are then mapped onto the extreme opposite respiratory phase to determine the change in volume (target, normal lung, etc.) and dose to the areas of treatment. **Method and Materials:** A 40-slice Siemens SOMATOM® Sensation Open CT unit was utilized for the 4D acquisition of simulation data. The data was separated into ten (20%-100%-IN, and 0-80%-EX) respiratory phase bins for visualization of target motion. The 0% IN (inhalation) and 100% EX phases were contoured independently. The treatment fields were optimized on the 0% IN dataset to deliver 66 Gy, and minimized the surrounding critical organs. These fields were then mapped onto the 100%-EX (exhalation) bin, representing the opposite respiratory extreme, and subsequently re-calculated for the same volumes of interest. The dose volume histograms were exported into Excel for comparison of these two datasets. **Results:** Most of the data showed a target dose reduction. Changes in the target volume (size), maximum and mean target doses, as well as the ratio of minimum target dose to prescribed dose were seen. The change in target volume on the two image datasets ranged from +3.6% to –24.6%, with a negative value being a decrease in contoured volume. The change in mean target dose ranged from –0.1% to –15.9%, with a negative value being a decrease in mean dose coverage. Similarly, the ratio of minimum dose to prescribed dose coverage ranged from –3.4% to –21.4%. **Conclusion:** The results show the importance of using 4D image data to design treatment fields for lung cancer patients. Our knowledge of the target and normal anatomy motion continue to be paramount in designing treatment paradigms in the future.