

AbstractID: 8551 Title: Evaluation of patient setup accuracy for targeted marrow irradiation with image-guided helical tomotherapy

**Introduction:** Targeted marrow irradiation (TMI) using intensity-modulated fields could allow dose escalation while limiting radiation toxicities to critical organs for patients who traditionally would receive total body irradiation. In this study, we evaluated patient setup uncertainties and the efficacy of our image-guided setup techniques for TMI treatments based on helical tomotherapy megavoltage CT image registrations.

**Methods and materials:** We analyzed image registrations from 206 treatment fractions for 26 TMI patients. Prior to each treatment fraction, two MVCT scans were performed encompassing the head & neck region and the pelvic region, respectively. Image registrations were performed for each scan. The two image registrations were averaged to correct patient setup errors.

**Results:** In the head & neck region, the mean and standard deviation (SD) of setup corrections was  $3.5 \pm 6.4$  mm in the RL direction,  $-2.4 \pm 5.3$  mm in the SI direction,  $-0.7 \pm 5.8$  mm in the AP direction, and  $0 \pm 1.2^\circ$  in roll. In the pelvic region, it was  $1.5 \pm 7.7$  mm in the RL direction,  $-3.7 \pm 5.6$  mm in the SI direction,  $2.1 \pm 5.7$  mm in the AP direction, and  $0 \pm 1.1^\circ$  in roll. After the two registrations were averaged, it was  $2.5 \pm 6.6$  mm in the RL direction,  $-3.1 \pm 5.1$  mm in the SI direction,  $0.7 \pm 5.1$  mm in the AP direction, and  $0 \pm 0.8^\circ$  in roll. The residual setup errors in the head & neck region had mean and SD of  $1.0 \pm 2.5$  mm in the RL direction,  $0.7 \pm 1.9$  mm in the SI direction,  $-1.4 \pm 2.7$  mm in the AP direction, and  $0 \pm 0.8^\circ$  in roll.

**Conclusion:** The two-scan technique ensured that the superior and inferior portions of the patient bony structure were properly set up in most cases. In cases when the residual setup errors were significant, the superior and inferior segments should be treated separately with separate setup corrections to ensure adequate target volume coverage.