AbstractID: 10846 Title: To Reduce Hot Dose Spots in Craniospinal Irradiation: A Two-Field IMRT Approach with Matching Beam Divergence

Purpose: In conventional craniospinal irradiation (CSI), hot/cold dose spots are commonly seen with two adjacent fields that cover the spinal cord due to different beam divergences. The purpose of this study was to develop new techniques to reduce or eliminate the hot/cold spots, and achieve a more uniform dose coverage of the spinal cord.
Materials and Methods: Two approaches to reduce the effect of beam divergence were investigated. Tilted beams were used with the table in the 90^{o} position and patient in prone position. In the first method, we used four beams in two pairs to reduce the divergence. Wedges were used to improve the dose uniformity. In the second method, two IMRT fields with beam-divergence match were employed to compensate the dose inhomogeneity due to different SSD. Based on a phantom torso, plans were created for each new method and compared with the conventional CSI technique.
Results: Both new techniques improved the dose homogeneity of spinal cord. When normalizing the mean dose to 180 cGy, the minimum dose is approximately 168 cGy for all three plans; however, the maximal cord doses are different: 237, 204 and 201 cGy for the conventional, 4-field and IMRT plans, respectively. The maximal body dose is 269, 214 and 216 cGy, and the volumes receiving a dose >200 cGy are 128, 78 and 42 cm^3, respectively.
Conclusion: Two new techniques with matching beam-divergence have been developed for CSI to effectively reduce hot/cold spots and improve the dose uniformity in the spinal cord. The two-field IMRT technique showed the best improvement in dose homogeneity, and is feasible to be implemented clinically. The 4-field technique can be used in IMRT-incapable facilities. The observed improvements in dose coverage and homogeneity with the beam-divergence matching techniques warrant further studies with more patient data.