

AbstractID: 2836 Title: Peripheral Doses from Pediatric IMRT

Purpose: Peripheral dose (PD) data exists for conventional and IMRT delivery to standard adult sized phantoms. Pediatric PD reports are limited to conventional therapy and are model based. Our goal was to ascertain whether data acquired from full phantom studies and/or pediatric models, with IMRT modifiers, could predict Organ at Risk (OAR) dose for pediatric IMRT. As monitor units (MU) are greater for IMRT, it's expected IMRT PD will be higher, potentially compounded by smaller phantoms.

Method and Materials: Five patients with cranial lesions were chosen. Conventional 3D plans for the same patient/target/dose (180cGy), were optimized without limitation to number of fields or wedge use. 6MV, 120-leaf Varian axial beams were used. A "3-year-old" phantom was configured per CDC data. Micro (0.125cc) and cylindrical (0.6cc) ionization chambers were appropriated for the thyroid, breast, ovaries, and testes. PD were recorded by electrometers set to the 10^{-10} scale. Each system set was calibrated to the dose range. Attention was paid to field sizes and MU.

Results: Thyroid dose was lower for IMRT delivery than predicted or for 3D, (ratio of IMRT/Conventional ranged from 0.47-0.94), doses \sim [0.4-1.8cGy]/[0.9-2.9cGy]/fraction, respectively. Prior reports are for fields 10cm or greater, while pediatric CNS fields range from 4 to 7cm and effectively much smaller for IMRT (2-3cm). This close proximity (\sim 7.5 cm from field edge) is dominated by internal scatter, therefore field size differences overwhelm phantom size affects and increased MU. Distant PD dominated by head leakage, were higher than predicted, even accounting for MU (\sim factor of 3) likely due to the pediatric phantom size. The ratio of testes dose ranged from 3.3-5.3 for IMRT/Conventional.

Conclusion: PD to OAR for Pediatric IMRT cannot be predicted from with large field, full phantom studies. For regional OAR, doses are likely lower than predicted by existing data, while distant PD are higher.