

AbstractID: 13415 Title: Impact of Treatment Couch Shifts on Radiotherapy Dose Delivery When Couch Attenuation Is Included in Dose Calculation

Purpose: Studies have shown that attenuation by a carbon-fiber treatment couch can substantially affect radiotherapy doses if it is not included in the calculations. Modern treatment planning systems provide for a modeled couch for use in dose calculations. However, if the couch position during treatment differs from that used for calculation, substantial differences between calculated and delivered doses can occur. In this study, we investigate the dosimetric impact of a couch lateral shift and make recommendations to mitigate its impact.

Method and Materials: Radiation doses in a rectangular phantom were measured for a 6-MV beam passing through a Varian Exact Couch at various gantry angles with supporting rails positioned at the center and on the sides. The couch was laterally shifted 5 cm in each direction at steps of 1 cm while the phantom position remained stationary. Dose discrepancies were analyzed by comparing measurements with and without couch shifts. Dosimetric effects were assessed for various beam arrangements, including 5, 7 and 9 equi-spaced beams.

Results: Dose discrepancies greater than 20% were observed with lateral couch shifts. A shift of 1 cm introduced dose errors as large as 10.9%. The largest dose errors occurred when unaccounted for couch shifts placed the supporting rails into or out of the beam with the couch. For treatment plans with 5, 7 and 9 equi-spaced beams, moving the rails to the sides generally resulted in substantially lower dose discrepancies.

Conclusion: Couch position discrepancies between treatment plan and delivery can introduce substantial dose errors. It is therefore important to position the couch exactly as planned. If the couch can not be positioned accurately, moving the supporting rails to the sides generally reduces dose errors for commonly used treatment plan with 5, 7 and 9 equi-spaced beams.