AbstractID: 5810 Title: Independent Calculation of Dose for a Helical TomoTherapy Treatment Plan

Purpose: To develop a new calculation algorithm for independently verifying doses from helical TomoTherapy treatment plans.

Method and Materials: The calculation algorithm confirms dose to a point in a high-dose, low-gradient region where modulation is expected to be minimal. Inputs to the algorithm are the coordinates of the point, the radiological depth for each projection angle in the axial plane of the point, and the treatment sinogram. The algorithm uses common dosimetric functions (e.g., TPR, S_{cp}), which were measured on the TomoTherapy treatment unit. Measured lateral and longitudinal profile data are used to quantify the off-axis dose dependence. Test comparisons were made using a 7-cm diameter PTV centered in a 20-cm diameter cylindrical phantom. The phantom was positioned in the center of the treatment bore for one test and 10 cm off-axis for another. Comparisons were also made for five prostate cancer treatment plans. In all cases, the point of calculation was the geometric center of the PTV.

Results: Measurements of both TPR and S_{cp} on the TomoTherapy unit demonstrated small variation with jaw width (field length) and the number of open leaves (field width). Therefore, average values of TPR(d) and S_{cp} were used in the algorithm. Comparisons with the cylindrical phantom treatment plans demonstrated good agreement, with the calculated doses agreeing within 2% at the PTV center for both the on-axis and off-axis treatment plans. Results for the prostate patients also showed good agreement within 4%.

Conclusion: A new calculation algorithm that uses standard dosimetric functions has been developed for verifying doses from helical TomoTherapy treatment plans.

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