

AbstractID: 6886 Title: Novel application of serial tomotherapy based intensity modulated radiation therapy to a cobalt (^{60}Co) teletherapy system

Purpose: To investigate the application of serial tomotherapy based IMRT to a cobalt (^{60}Co) teletherapy unit with a 2cm diameter source emitting gamma radiation modulated with a MIMiC binary multi-leaf collimator.

Method and Materials:

Modifications were made to the CORVUS finite size pencil-beam dose model to account for unique features of cobalt (^{60}Co) teletherapy. The geometric kernel representing the source distribution was changed from a Gaussian appropriate for linear accelerators to a two dimensional circ function (also called a radially symmetric Heaviside step function) which better represents the isotropic radiation emanating from the cylindrical cobalt source. The Clarkson integration used to compute scatter dose was modified to reflect partial source obfuscation when fields are small compared to the source size. A correction in the generation of leaf sequences was made to account for the interplay of leaf curvature with the large diameter source. Finally, a shield was developed to compensate for the unique leakage characteristics of the teletherapy system studied. The system was compared with QA measurements made using EDR2 film for eight cases including head-neck, prostate, and acoustic neuroma with the MIMiC operating in 2cm mode (nominal leaf size 1cmx2cm).

Results:

Excellent relative agreement was obtained with respect to film; for each plan at least 97% of points passed the χ^2 comparison corresponding to 4%, 4mm. A consistent 5% normalization scale discrepancy was noted which may be caused by film calibration issues. On further investigation, the scale discrepancy was decreased to 2.5% when parallel film calibration was applied rather than perpendicular calibration. Additionally, average film agreement compared to ion chamber improved under parallel calibration.

Conclusion: A unique method of applying serial tomotherapy based IMRT to cobalt teletherapy systems was developed with very promising dosimetric agreement with measurement.

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