AbstractID: 8183 Title: Segmented Field Electron Conformal Therapy Planning Algorithm

Purpose: To develop a clinically useful forward planning algorithm for determining the energy, shape, and weight of multiple abutted fields used in segmented-field electron conformal therapy (SFECT) that conforms the 90% isodose to the PTV while minimizing the treatment of normal tissue.

Method and Materials: An algorithm was developed that requires a beam's eye view (BEV) of depth of the distal PTV surface. First, the minimum energy for which R_{90} (10-cm diameter field) exceeds the depth to the distal edge of the PTV is determined for each pixel of the BEV. Next, the minimum circular field size to treat R_{90} to the distal edge of the PTV is determined for each pixel and drawn around the pixel. Fields of the same energy are merged with higher energy fields taking precedence in areas of overlap, and the dose distribution is calculated. Finally, an iterative process is used to modify the fields to converge the 90% dose surface to the distal PTV surface. The algorithm was used on six hypothetical PTVs, and the dose distribution was compared to that of a single energy plan. A pencil-beam algorithm calculated the dose distribution for both sets of plans.

Results: The SFECT plans were able to deliver 90% of the dose to over 95% of the PTV, while irradiating an average of 16% less non-PTV to 90% of the dose. Due to abutment dosimetry, SFECT plans increased dose range within the PTV by an average of 4.9%.

Conclusion: The developed algorithm was useful for determining SFECT plans in a water phantom. SFECT plans irradiate significantly less non-PTV volume than single energy therapy, but at the expense of increased dose range within the PTV (D_{90-10}).

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