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COMPARISON OF ELECTRON DOSE DISTRIBUTION IN FILM WITH TREATMENT PLANNING SOFTWARE PREDICTIONS

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Purpose: Electron beams are used for a number of treatments, such as head and neck tumors, that often require extended source to skin (SSD) distances, oblique angles and irregular surface contours. This study will measure the ability of the treatment planning software (Pinnacle 8m) to accurately predict these non ideal situations.

Methods and Materials: Parallel oriented EDR film was placed in solid water to measure accuracy of 9 MeV, 12 MeV, and 20 MeV at gantry angles of 0°, 15°, 30°. Two different field sizes, 6 x 6, and 10 x 10 were also used for the comparison. Finally, a Rando phantom with an electron block was used to measure the dose distribution in the head and neck region with film placed between the phantom slices. Analysis of the dose was done using isodose lines and gamma pass/fail plots using distance to agreement of 3 mm and percent dose difference of 5%.

Results: For the normally incident beams, the percent points passing were 97.91%, 99.1%, and 94.42% for 9, 12, and 20 MeV energies respectively for the 10 x 10 cm field. The results were 12-19% lower for the 6 x 6 field. There was decreasing agreement with increasing obliquity with 57% agreeing for 20 MeV electron beam with 6 x 6 field. The Rando phantom measurements indicated an underestimate of the 90% isodose coverage.

Conclusions: Computed electron dose distributions seem to consistently underestimate the size of the field based on film measurements with increasing disagreement with obliquity, smaller field sizes and increasing energy.