AbstractID: 4366 Title: Dosimetric Properties of 8 and 10 MV Photon Beams from a Flattening Filter Free Clinical Accelerator

Purpose: In previous studies we indicated that removing the flattening filter from the beamline could improve some photon treatments. Optimal energies for treatments with unflattened beams may need to be higher than for the same treatments with flattened beams, in part owing to softer photon spectra. Since for flattened beams best results are often achieved at 6 MV, in this study of unflattened beams we investigated basic properties of 8 and 10 MV photon fields.

Methods and Materials: This is a computational study based on the Monte Carlo method. We used the BEAMnrc program to model the Varian Clinac 2100 series accelerator.

Results: Increasing the energy from 6 to 8 or 10 MV: (1) improves the efficiency of bremsstrahlung production. We calculated photon energy fluences (per incident electron) in air at 100 cm from the source for a 10×10 cm^2 field. The ratios of energy fluences of unflattened beams to flattened 6 MV beam were 2.29, 4.14, and 8.23 at 6, 8, and 10 MV, respectively; (2) improves beam penetration. The percent depth doses (PDDs) for a 10×10 cm^2 field at 10 cm depth were 63.6, 67.2, and 69.0 at 6, 8, and 10 MV; (3) reduces skin dose. PDDs for the above field at 0.3 cm depth were 76.5, 70.1, and 63.3 at 6, 8, and 10 MV, compared to 69.5 for a flattened 6 MV beam; (4) moderately increases nonflatness. The ratios of maximal to minimal doses within 80 % of the width of a 10×10 cm^2 field at 10 cm depth were 1.14, 1.18, and 1.23 at 6, 8 and 10 MV.

Conclusion: The main dosimetric parameters of unflattened 6 MV beams can be improved by increasing the energy to 8 or 10 MV.

Conflict of Interest: Research is sponsored by Varian Medical Systems.