

AbstractID: 5446 Title: A treatment planning study of liver cancer treatments with a flattening filter free linear accelerator

Purpose: Our preliminary studies have shown that the removal of the flattening filter from the beam-line of a medical linear accelerator increases the dose rate, reduces head scatter and reduces dose outside the treatment volume. Although, in principle, the filter is unnecessary when a multileaf collimator is present, it remains to be seen whether treatments with unflattened beams are clinically feasible. In this study we investigate the application of flattening filter free photon beams for the treatment of small liver cancer tumors to determine if these beams offer an advantage for respiratory-gated radiotherapy.

Methods and Materials: This is a treatment planning study. We created plans using Eclipse 8.0 (Varian Medical Systems), which we commissioned with measured (6 MV, 18 MV) and Monte Carlo (10 MV) data for a Clinac 21EX linear accelerator, operated with and without a flattening filter. We selected several conventional 3D conformal treatment plans for flattened beams with field sizes not exceeding 10 cm × 10 cm. These were then compared with treatment plans, including 3D conformal plans and IMRT plans, developed with unflattened beams.

Results: Dose distributions for treatment volumes and nearby critical structures were typically equivalent for the intensity-modulated plans with flattened and unflattened beams. The number of monitor units required to deliver the same dose was much lower in the plans with unflattened beams. For example, at 18 MV the total number of monitor units in the intensity-modulated plans with unflattened beams was about 1/2 of those in the conformal 3D plans with flattened beams.

Conclusion: In this study we show that clinically acceptable treatment plans for liver cancer can be obtained with unflattened beams. With respiratory-gated radiotherapy, the high dose rates achieved with unflattened beams may shorten the overall treatment time dramatically.

Conflict of Interest: Research sponsored by Varian Medical Systems