AbstractID: 6548 Title: Preliminary Dosimetric Investigations into Gated IMRT

The recent development of intensity modulated radiotherapy allows for tumor dose escalation while maintaining or reducing the surrounding normal tissue dose. However, respiratory motion has been recognized as an impediment to dose escalation, prompting the use of techniques such as respiratory gating. In this study we evaluate the feasibility of combining these two modalities.

Respiratory triggering was accomplished with an infrared photogrammetry system, which detects markers placed on the patient. The gating system communicated with the accelerator through a gating interface provided by the manufacturer. Point dose and dose rate were examined for a dynamic wedge, an arbitrary IMRT, and a clinical IMRT field from 25 to 200 monitor units under gating frequencies from 0.2 to 1 Hz. Flatness and symmetry were evaluated using an amorphous-silicon detector. A gating phantom, which consisted of an oscillating solid water block and film, was used to compare dose distributions on film between oscillating and stationary targets, both gated and non-gated.

Significant differences between gated and non-gated fields were found only in low dose areas of the dose distributions, or with a low number of monitor units. The dose difference between gated and non-gated fields averaged over the entire field is less than 1% for a high number of MUs and less than 3% for a low number of MUs. No significant dose differences were found between stationary, non-gated films and oscillating, gated films.

This study suggests that respiratory gating and IMRT can be combined to produce a single effective treatment modality.