

AbstractID: 4657 Title: Multi-slice Tomotherapy Delivery Methods using a Novel Multileaf Collimator

Purpose:

In this study, we present an initial dosimetric investigation of multi-slice tomotherapy delivery methods using a novel multileaf collimator design.

Method and Materials:

A compact multileaf collimator design for multi-slice tomotherapy is under investigation. Intensity modulation is achieved through binary actuation of adjacent pivoting leaves with multiple leaf banks employed to deliver multi-slice tomotherapy. Pitch may be determined by the ratio of the couch travel distance for a complete gantry rotation divided by the slice width at the axis of rotation. For multi-slice tomotherapy the concept of pitch is complicated by the use of multiple collimated slices and differing fan beam divergences. We have studied the dosimetric effect of: (a) using regular pitch, where a given collimated slice does not irradiate beyond the adjacent slice and (b) using multi-slice pitch, where different collimated slices irradiate the same region in the patient. Other novel aspects of tomotherapy delivery with the multi-slice collimator are presented.

Results

The multi-slice pitch delivery method allows for treatment of extended volumes greater than the spacing between slices, without the junctioning effect of the regular pitch method. A pitch less than 1 may be achieved when considering irradiation from different collimated slices and is determined by the slice spacing, slice width and couch travel. The difference in fan beam divergence in the axial direction may be clinically advantageous. Single-slice techniques may also benefit from non-coplanar delivery.

Conclusions:

A method for multi-slice tomotherapy delivery is investigated. Dosimetric results are presented for various methods of dose delivery including a multi-slice pitch method for extended treatment lengths. Multi-slice delivery will result in shorter treatment times for both linac and cobalt-based tomotherapy systems and development of novel radiation therapy techniques.

Conflict of Interest:

Research was supported in part through a licensing agreement with TomoTherapy Inc.