

Purpose:

Analyze new capabilities for planning and delivery of helical tomotherapy using very loose pitch and also fix angle gantry deliveries while the couch is moving in and out of the gantry. Compare these deliveries respect to typical helical tomotherapy deliveries created using small pitch.

Method and Materials:

In a typical tomotherapy plan, the delivery is achieved using a binary (MLC) in a rotating gantry while the couch is moving with pitch typically smaller than 1. In this manuscript two new planning and delivery capabilities were developed. The first one, topotherapy has the gantry fixed at few angles (no rotation) while the couch moves and the MLC modulate the beam. After the delivery of a direction is finished the gantry move to a new fix position and the same process is repeated. In the second method, dynamic tangents, the gantry is rotating slowly in an small arc and the couch is moving while the leaves are modulating. The techniques were used in simulated breast treatments.

Results:

Topotherapy and dynamic tangent are good alternatives for plans where the more important beam directions are easily determined. In topotherapy, pitch regulates the degree of modulation inferior-superior. The dynamic tangents technique can achieve the same level of target coverage as topotherapy. However, dynamic tangents can further reduce the dose to surrounding normal tissues. Both techniques can achieve very uniform dose distributions without increasing the dose to normal tissues.

Conclusion:

Helical tomotherapy allows delivering very sophisticated plans. However, for certain anatomical sites where the number of beam directions will not impact the plan quality (such as breast, palliative, AP-PA, etc) topotherapy and dynamic tangents can be implemented more efficiently. For these simple cases, good dose uniformity and coverage can also be achieved without compromising normal tissue irradiation.

Conflict of Interest:

TomoTherapy-Inc.