

AbstractID: 3116 Title: The Effect of Breast Motion on Dose Distribution in Tangential IMRT with Direct Aperture Optimization

Purpose: Inverse planning for breast IMRT can be accomplished with Direct Aperture Optimization (DAO) where the user defines the traditional tangential fields within which the shapes and weights of multiple segments, including an open segment as ‘flash’, are optimized. The purpose of this study is to evaluate the technique and examine the effects of relative weights of the open segments to other segments on the impact of breathing motion.

Method and Materials: IMRT plans were generated using DAO inverse planning with manually fixed relative weights of the open segments. To simulate breathing motion, the same set of optimized segments was reapplied with the isocenter shifted up and down by up to 1cm and the resulting dose distributions were added. The quality of both the static plans and the composite plans were compared among different open segment weights.

Results: Five cases with varying breast sizes were examined. For the static plans, we found that uniform dose distributions could be generated with relative weights of the open segments in the range of 45-85%. Unacceptable hot spots were produced when the weights of the open segments were larger than 85%. For composite plans simulating breathing motion, the most uniform dose distribution happens when the open segment weights were in the range of 75-85%, below which the dose uniformity degrades. We observed that in the composite plans, for each 1% decrease in the open segment weighting, the volume covered by the 98% dose decreased by approximately 0.06%, independent of breast size.

Conclusion: DAO provides a robust and efficient technique for breast IMRT planning. The proper open segment weight was found to be between 75% and 85%, and is not significantly dependent of breast size and laterality. Within this range, high-quality IMRT plans were produced for each case.

Conflict of Interest (only if applicable):