AbstractID: 13096 Title: Planning study for Cone Beam Therapy

Purpose: Cone beam therapy (CBT) has been proposed as a form of rotational IMRT that can potentially offer fast delivery with equal or superior plan quality. This work aims to investigate CBT planning methods to generate high-quality plans.

Methods and Materials: The idea of CBT is to spread apertures for a beam to neighboring beam angles enabling non-overlapping apertures to be delivered with gantry rotation. A prototype (Prowess Inc) with this algorithm implemented was used for this study. A full arc consisting of 72 equally-spaced initial coplanar beams, optionally combined with a partial arc and non-zero couch angle selected to avoid direct irradiation of organs-at-risk (OAR), was used to generate single- or two-arc CBT plans. Plans for TomoTherapy, and conventional IMRT were also generated using the same CT and contours. For CBT and IMRT plans, a linac equipped with 160 MLC (Artiste, Siemens) with a possible dose rate of 1000 MU/min was considered. Plans for 10 representative brain and head and neck cancer patients were generated.

Results: Two-arc CBT offers equal or better plan quality than single-arc. On average, the uniformity index for PTV was improved by 1.4% and the EUD for organs at risk (OAR) reduced by 25% when comparing two- and single-arc CBT plans. Compared with TomoTherapy, the two-arc CBT can lead to reduced EUD for OAR (12.9% on average) but with reduced dose uniformity in target (5.6% on average). The average delivery times for single- and two-arc CBT are estimated to be 2 and 5 minutes, respectively, shorter than TomoTherapy (8 minutes).

Conclusion: Two-arc CBT can generate equal or better plans than single-arc CBT and conventional IMRT. Compared with TomoTherapy plans, the two-arc CBT plans offer improved OAR sparing but with decreased dose uniformity in targets. The delivery times of CBT were estimated to be 2-5 minutes.