AbstractID: 13798 Title: A method incorporating 4DCT data for evaluating the dosimetric effects of respiratory motion in single arc IMAT

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Purpose: The purpose of this work was to introduce a method to investigate the effect of the breathing motion in a single arc IMAT. We also investigated the role of plan complexity on the dosimetric impact of the respiratory motion in the delivery of VMAT.

Method and Materials: The patient's motion model was built from deformable registration over 4DCT images. IMAT plans (one moderately modulated, another highly modulated) were partitioned into 10 (skip & shoot arc) sub-plans, which were delivered to each of 10 corresponding CT phase image. The dose distribution was re-warped with a deformation map into a reference phase CT image. The organ dose was derived from the weighted sum over all of the phases.

Results: The moderately modulated plan had an average leaf movement of 386 mm and mean leaf gap of 37.9 mm. The highly modulated plan had a maximum leaf movement of 625 mm and leaf gap of 17.2 mm For a patient with a maximum motion displacement of ~15 mm, the dosimetric impact is rather small and can be ignored for both of moderately and highly modulated IMAT, irrespective of number of fractions. Specifically, highly modulated plans only increased the degradation of D_{95} of the DVH curves for a single fraction by 2% in the CTV and 9% in the PTV compared to the mean value from a 25 fraction plan.

Conclusion: Although single Arc IMAT has less flexible intensity modulation per beam direction, in the treatment of the lesion within the throax- abdominal site, less interplay between the organ motion and the dynamic movement gave it an advantage over the conventional IMRT techniques.