AbstractID: 4343 Title: Adaptive IMRT using Cone-Beam CT: A case study on patients with bulky head and neck tumors

Purpose: The objective of this work is to demonstrate the feasibility and efficacy of acquiring on-board Cone-Beam CT (CBCT) volume images for adaptive radiotherapy (ART) and image-guided-radiotherapy (IGRT) for patients with bulky head and neck tumors treated with IMRT.

Method and Materials: The quality of the CBCT volume images acquired on the treatment table was evaluated by measuring the spatial accuracy, contrast, resolution, and the curve for converting CT number to electron density. A patient planning CT volume images were acquired before treatment and at mid-course. CBCT volume images were acquired weekly during treatment. To cover the IMRT fields, two CBCT acquisitions were combined into one volume image using in-house software. PTV and organ contours were copied from the pretreatment CT volume to the CBCT volume and adjusted as necessary. The IMRT plan was applied to the CBCT volume and dose-volume histograms were calculated for the adjusted PTV and spinal cord. The CBCT images were used for patient treatment verifications and dose calculations for ART.

Results: Significant changes in the skin contours and PTV contours were seen on patients with bulky HNC after as few as five treatments. The dosimetric consequences were also significant. Adapting the IMRT plan to the changes in patient anatomy by re-optimizing on the CBCT volume was found to be feasible. For patients whose Head and Neck cancer was not bulky, there were no significant changes in setup or anatomy.

Conclusion: It is feasible to acquire weekly CBCT images on the treatment table for analyzing significant changes in anatomy and determine dosimetric consequences of those changes. The CBCT can be used to obtain the accumulative target dose and to modify treatment plans without performing additional planning CT. The CBCT is shown to be a very effective tool for ART for IMRT treatment.