AbstractID: 8347 Title: Dosimetric impact of anatomy variations and benefits of mid-course replanning for head and neck IMRT

Purpose: To investigate the dosimetric impact of changes in patient anatomy during treatment for head and neck IMRT, and to assess the benefit of replanning.

Method and Materials: This study included 16 head and neck patients who had a repeat CT scan during their course of radiotherapy. Reasons for rescanning included weight loss and tumor or nodal shrinkage. For each patient, the original (CT1) and second (CT2) scans were registered using deformable registration. Contours deformed from CT1 to CT2 were evaluated by a radiation oncologist and modified as necessary. All volumes (tumor and normal tissues) were modified based on changes in anatomy. The original treatment plan was transferred to CT2 using bone-based rigid registration and recomputed. Additionally, a new IMRT plan was designed on CT2, based on the changed anatomy. These three dose distributions (original plan, original plan on CT2, and new plan on CT2) were compared. Dosimetric results were calculated as though the whole treatment was delivered on a single anatomy (i.e., not taking into consideration partial dose delivered).

Results: The median time to rescanning was 29 days. The average reduction in volumes (CT2/CT1) were: GTV 67%, high-dose CTV 84%, ipsilateral parotid 69%, contralateral parotid 71%. The increase in mean ipsilateral parotid dose on CT2 was 4.8±3.4Gy (original plan), and 2.0±6.1 Gy with replanning. Changes for contralateral (spared) parotid were smaller. For 8/16 patients, the maximum spinal cord dose increased to greater than 45 Gy on CT2 (original plan). With replanning, it was reduced to less than 45 Gy in all cases. GTV and CTV coverage was largely unaffected by changes in anatomy or replanning.

Conclusion: Changes in patient anatomy led to increases in mean parotid and maximum spinal cord and target doses, although target coverage was unchanged. Replanning may reduce parotid and spinal cord doses.