AbstractID: 3392 Title: Dosimetric impact of anatomic variations for head & neck cancer patients undergoing IMRT treatment analyzed by deformable imaging registration

Purpose:
The anatomy in some head and neck cancer patients can vary significantly during the course of radiation therapy due to weight loss and/or tumor shrinkage. The purpose of this study is to investigate the dosimetric impact of such changes for patients who have had second CT imaging during their IMRT treatments.

Method and Materials:
Patients had second CT imaging at the request of their treating physician due to a change in the patients' anatomy. In order to focus on the dosimetric effect due to soft tissue changes only (excluding setup errors), the second CT was first registered to the planning CT using an in-house CT-to-CT translation-only bony-registration algorithm. Then the IMRT fields for the same treatment plan were applied to the second CT to obtain the dose distribution in the altered anatomy. In order to compare the dose distributions relative to the original plan, a voxel-by-voxel deformable image registration algorithm was used to map the dose distribution delivered to the 2nd CT back to the original treatment plan. The dosimetric effect can be then analyzed using the original contoured structures for critical organs and the planned targets.

Results:
There were significant variations in doses to some normal structures such as the ipsilateral parotid gland; while the mean dose to CTVs had only modest changes. In a preliminary analysis of 5 patients, the mean ipsilateral parotid dose increased 6.3±5.6 Gy(18.4%±16.5%), while the mean contralateral parotid dose only increased 0.7±1.4 Gy(2.4%±5.1%). The coverage for CTVs was reduced 3.1±3.5%. There was no significant change in the doses to spinal cord, brainstem, or mandible.

Conclusion:
We found noticeable changes in dosimetry for patients undergoing IMRT treatments, particularly in the ipsilateral parotid gland. With deformable image registration, we have demonstrated dosimetric changes for head and neck cancer patients during their courses of radiation therapy.