AbstractID: 12613 Title: Breathing Motion and Deformation of Pancreatic Cancer Patients and its Effect on Planning Dose

Purpose: Generate a deformable model of the pancreas and surrounding anatomy and evaluate the dosimetric impact of respiration motion on the pancreas and the surrounding organs-at-risk (OARs) during radiation therapy for pancreatic cancer.

Methods and Materials: A multi-organ, biomechanical model-based deformable image registration platform (MORFEUS) characterize exhale to inhale breathing motion from the 4DCT treatment planning images of seven pancreatic cancer patients. The deformed pancreas and OARs were compared to their respective volumes contoured on the inhale images using a volume overlap criteria (DICE). The dose delivered to the OARs during free breathing was calculated using MORFEUS and compared to the static planning dose.

Results: The DICE using MORFEUS for the pancreas, duodenum, left and right kidneys was (mean±SD) 0.79±0.06, 0.71±0.08, 0.89±0.05, and 0.88±0.06 respectively. The effect of breathing on the max and mean dose was small, however, differences were seen in the dose to a percentage of the volume. For the duodenum, 4 patients had an average dose difference of 1.9±0.9 Gy for 60-90% volume (max 4 Gy). Similarly for the stomach, 6 patients had an average dose difference of 1.8±1.1 Gy for 20-50% of the volume (3 patients had > 3 Gy). One patient had 1.8 Gy difference to 40% of the bowel volume.

Conclusion: A deformable model of the pancreatic cancer anatomy was developed and shown to provide good volume overlap. Due to the overlap of the CTV with the OARs, the dosimetric effect of breathing on the overall max dose was small, however changes of more than 1 Gy were observed in the duodenum, stomach, and bowel to a percent of the volume, which may have clinical significance especially in these patients treated with combined radiosensitizers.

Research sponsored by NIH 5RO1CA124714-02, Elekta Oncology Systems, and K. Brock is supported by a Cancer Care Ontario Research Chair.