

AbstractID: 10667 Title: 4D Multi-organ Motion Analysis in Pancreatic Cancer Patients

Purpose: Center of mass (COM) motion, bounding box motion and volume fluctuation analysis of the clinical target volume (CTV), liver, kidneys, stomach and duodenum in pancreatic cancer patients were measured using 4DCT and deformable registration. **Methods and Materials:** Eight patients with pancreatic cancer underwent 4DCT for treatment planning. The scans were binned into 10 phases (T00 to T90) and a physician contoured the GTV, CTV, and other abdominal volumes of interest (VOIs) on the T30 phase scan. Deformable registration was applied to propagate the contours to other respiratory phases. Subtraction images were used to validate the registration. We calculated the superior-inferior (SI), anterior-posterior (AP), and left-right (LR) coordinates of the VOIs' center of mass, bounding box margin, as well as volume as a function of respiratory phase. **Results:** The greatest motion was in the SI axis, with lesser motion in the AP direction. Motion in the LR axis was negligible. Bounding box analysis showed anisotropic movement of the SI and AP edges of organs. The superior margin of the liver showed the greatest movement. In multi-organ motion analysis, several trends were observed: 1) SI motion of the right kidney and liver were nearly identical; 2) right kidney range of motion was greater than the left kidney motion in 6 of 8 patients 3) Volume fluctuation as a function of respiratory phase of all abdominal organs studied was < 8% of the average organ volume. **Conclusion:** We have validated and implemented 4D routine motion analysis of abdominal organs. Quantification of organ motion is a necessary step in designing the radiation treatment plan of a moving target. Coupled with dosimetric analysis, it provides metrics for evaluating the need for gated treatment.