

AbstractID: 3867 Title: Patterns of intraabdominal organ motion as measured by quantitative 4D CT

Purpose: Many clinics are investigating the use of IMRT for intraabdominal malignancies. Respiratory motion must be measured to determine optimal target and normal tissue margins. The purpose of this study was to quantify the movement of abdominal organs with non-coached respiration.

Method and Materials: Ten patients with hepatobiliary malignancies underwent quantitative spirometry during a multislice-CT following standard helical-CT simulation (Philips Brilliance 16-slice). Abdominal CT images were reconstructed by tidal volume, capturing end-expiration, mid-inspiration, end inspiration, and mid-expiration. Each CT reconstruction was fused with the standard helical-CT simulation. The liver, spleen, stomach, pancreas, kidneys and surgical clips were contoured for each patient when applicable. The organ motion was determined by measuring the distance between the geometric center of end-expiration and end-inspiration contours. Hysteresis was determined by measuring the distance between the geometric centers of the mid-inspiration and mid-expiration contours.

Results: A total of 72 structures have been contoured in eight patients. Five patients were status-post pancreatic resection. Hysteresis in organ movement was demonstrated when comparing mid-inspiratory and mid-expiratory contours, with differences in mid-inspiration and mid-expiration contours of up to 1.59cm. Total max-inspiratory to max-expiratory movement for the liver, stomach, kidneys, spleen, and pancreas were 1.00, 1.46, 1.29, 1.52, and 1.16cm. Total mid-inspiratory to mid-expiratory movement for the liver, stomach, kidneys, spleen, and pancreas were 0.51, 0.76, 0.71, 0.78, and 1.12cm. The maximal movement for the liver, stomach, kidneys, spleen and pancreas were 1.47, 2.47, 1.90, 2.29 and 1.73cm. Results for the surgical clips were similar.

Conclusion: Despite the anatomic variation expected in a diverse population, all the upper abdominal organs moved inferiorly and anteriorly with inspiration. Each organ moved at least 1cm on average, and more than 2cm in certain patients. Hysteresis was significant in some patients. Further work to investigate changes in dose distribution from this movement is ongoing.