AbstractID: 7464 Title: Development of a Methodology to Determine Dosimetric Accuracy in Moving Tumors using a CIRS Dynamic Phantom

Purpose:
Evaluate the dosimetric accuracy of synchronized respiratory motion with fiducial implants using image guided robotic radiosurgery and a CIRS dynamic phantom.

Method and Materials:
The CIRS Dynamic Phantom is an anthropomorphic chest phantom that contains a mini ball cube device with a tissue equivalent spherical target at the center. The ball cube device allows the inclusion of orthogonal placement of radiochromic film. The Synchrony system creates a respiratory model by synchronizing the position of LED beacons on the chest surface with images of the fiducials contained around the target. Gafchromic film was scanned using an EPSON 1680 professional scanner with 48-bit color at a resolution of 200 dpi. The red channel was extracted using ImageJ to acquire a 16-bit grayscale image. A dose response function was determined to calculate dose profile across the film.

Results:
Six treatments of 30 Gy were delivered to the dynamic phantom using multiple fiducials to track translational movements throughout the treatments. The dose average along the profile for each of the treatments ranged from 28.2 to 33.8 ± 2.1 Gy with maximum dose ranging from 43 to 49.6 ± 2.8 Gy. The prescribed doses calculated from the maximum dose ranged from 28.5 to 31.9 ± 1.1 Gy.

Conclusion:
Since the CIRS dynamic phantom allows for nonlinear motion, it is a more realistic method than using the traditional method with couch movements to test the positional accuracy of the Synchrony system. However, further experiments into the effect of variables (e.g., physical positioning alterations, dosimetry changes) on the treatment plan and delivery are required to determine the dosimetric consistency of tracking with Synchrony, and perhaps make clinical recommendations based on these measurements.

Conflict of Interest (only if applicable):
Not applicable