The feasibility of volumetric comparison between respiratory gating and ABC.

Purpose: To evaluate the feasibility of respiratory gating with respect to Active Breathing Control (ABC) for motion reduction through quantitative comparison.

Methods and Materials: 4D scans from a GE (Light speed) scanner with RPM were used for the feasibility study. Ten phase reconstructions were generated from the 4D projections and target volumes on all 10 phases were created by radiation oncologists. For free breathing treatments, target volumes from all 10 phases were added to generate the ITV used for clinical target. In order to simulate the gated treatment, the three phases of exhalation which best matched the gated delivery time period were combined. The target thus obtained was then compared with those obtained from the standard scan with the ABC device in place. Targets were contoured for the ABC scan as well. A volumetric comparison of the targets was performed for the above three methods.

Results: We tested the feasibility of the method on one of our patient cases for whom we utilized the ABC device for breathing motion control**.** The target volume for the 10 phase target was 25.49cc. The target volume from the simulated gated phases was 12.09cc and the target volume with the ABC was 11.19cc. Both the gated technique and the ABC control are able to reduce the target volume significantly, with about the same amount of reduction (52.57% and 56.1%).

Conclusions: This study established quantitatively that gated delivery technique can mimic the volumetric outcome of ABC delivery for motion control. Both are able to reduce the target volume significantly. We plan to further this study with more data collection.