AbstractID: 11599 Title: A Clinical Study of the Accuracy of Maximum Intensity Projection for Lung Tumor Volume

Purpose:
To evaluate tumor motion and accuracy of the Maximum Intensity Projection (MIP) reconstruction volume as it pertains to Internal Target Volume (ITV) targeting for treatment planning in radiation oncology.

Method and Materials:
Eight respiratory gating 4DCT lung cases were examined in this study. Gated scans were acquired on a Phillips Brilliance Big Bore 16 slice CT scanner with Varian RPM gating equipment using helical 3mm contiguous slices with a maximum pitch based on the minimum breath rate of the patient. The 4D protocol divided the breathing cycle into ten reconstructed phases followed by a MIP volume reconstruction. Tumor Loc was used to select a treatment isocenter and contour an ITV based on the MIP volume. The difference between the MIP reconstruction and maximum phase in each direction was measured to validate reconstruction. Additionally, the difference was measured between the MIP volume and a "non-gated" volume. Breath statistics were evaluated for average full inhalation and exhalation phase, amplitude range, and amplitude standard deviation. Maximum tumor movement was measured in the anterior/posterior, superior/inferior, and right/left directions between the average full inhalation and average full exhalation phases at the isocenter. Finally, a water filled ping-pong ball was scanned with motion provided by a Varian RPM phantom to evaluate motion artifacts and to evaluate discrepancy between the actual volume and gating reconstructed volumes.

Results:
Measurements between the MIP and the maximum phase reconstructions revealed discrepancy within expected measurement error.

Conclusion: This study showed that the MIP reconstruction is quite accurate and reliable for ITV targeting. Additionally the 4DCT protocol is appropriate for central disease and particularly valuable for peripheral disease. Breath statistics is a useful tool for selecting gated treatment to ensure the patient's breathing pattern is predictable and reproducible so as to benefit from gating.