AbstractID: 4918 Title: Feasibility Study of Management of Respiration Induced Target Motion for the Radiotherapy Treatment of Lung Cancer Patients in the Absence of a 4DCT Simulator

Purpose: Varian's RPM™ system for respiration induced tumor motion management allows acquisition of CT images and gated treatments under free breathing. 4DCT may not be possible because of lack availability of appropriate CT hardware or software. This study evaluated whether a breath hold CT scanning technique can be used as a substitute for a 4DCT scan.

Materials and Methods: A 4DCT scan is obtained on a 4 slice GE Lightspeed™ scanner with the patient breathing freely and the respiratory period regulated using audiovisual cues from RPM™. Additional helical scans are obtained using an end inhalation or exhalation breath hold modified gating method (MGM). The PTV is drawn on the MGM scan(s) and for each of phase of the 4DCT scan. Comparison of target volume, centroid and extent of target volume is made between the MGM scan and the corresponding phase of the 4DCT scan. A treatment plan is developed using the MGM scan. Dose is recalculated using the 4DCT scan with the beam's isocenter and apertures obtained from the MGM scan. DVH comparison is made.

Results: 20 patients had both a 4DCT scan and at least one MGM scan. 8 patients exhibited respiration induced target motion of >5 mm during free breathing. Maximum target motion observed was 25 mm. For 14 end inhalation scans, 9 passed, 3 passed marginally, and 2 failed the equivalency tests to the corresponding 4DCT scan. For 18 end exhalation scans, 14 passed, 4 passed marginally, and 0 failed the equivalency tests to the corresponding 4DCT scan.

Conclusion: All end exhalation breath hold scans are suitable substitutes for the corresponding phase 50 4DCT scan. However only 6/18 patients exhibited sufficient (>5 mm) respiration induced target motion on which to base any conclusions about the suitability of MGM.

Conflict of Interest: Research supported by Varian Medical Systems.