Purpose: This study evaluates the use of volumetric arc therapy (VMAT) for hypo-fractionated lung treatments to improve plan conformality and reduce chest wall dose.

Methods: Ten patients treated with hypo-fractionated lung SBRT were retrospectively planned with 270 to 360 degree arc VMAT and results were compared to the 4 – 5 field IMRT plans used for treatment. Prescription doses were 45, 48 or 54Gy in 5, 4 or 3 fractions, respectively. To compare plan quality, various dose-volume statistics were assessed for the PTV, spinal cord, esophagus, lungs, distal and mainstem bronchi. Conformity index \( \frac{V(95\%R_x)}{V_{PTV}(95\%R_x)} \) was also evaluated. Monitor units were compared to evaluate plan efficiency.

Results: Patient-averaged PTV D(99%), D(95%), and Dmax were 97.9, 101.2, and 107.8% respectively for VMAT and 98.6, 101.6, and 106.4% respectively for IMRT. Average conformity index was 1.79 for VMAT and 1.96 for IMRT (p<0.01). The most significant normal tissue dose improvement using VMAT was for the chest wall where the average D(30cc) was 24.5 Gy, 19% lower than IMRT (p < 0.01). The average total lung V(20Gy) fell from 5.6% with IMRT to 5% with VMAT but other total lung statistics (V(10Gy), mean dose ) were virtually identical. Average contralateral lung mean dose increased with VMAT (1.5 vs 1.1Gy, p<0.01). VMAT and IMRT maximum doses to cord, esophagus, mainstem and distal bronchi did not differ significantly. On average, MU required for VMAT delivery were 32% less than IMRT.

Conclusions: PTV coverage and most normal tissue doses were similar for VMAT and IMRT. Conformity index and chest wall D(30cc) improved with VMAT. Although total lung dose was similar for both plans, mean contralateral lung dose on average was higher for VMAT. The VMAT plans showed improved conformity and reduced chest wall D(30cc) at a cost of increased contralateral lung mean dose.

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Research agreement with Varian Corporation