

Purpose: Volumetric modulated arc therapy (VMAT) is introduced recently as a new lung stereotactic body radiotherapy (SBRT) treatment modality. Because of its shorter delivery time, it reduces the possibility of target misalignment due to patient motion. The dose distributions of VMAT plans are quite different from standard 3D therapy. This study quantitatively evaluates the VMAT plans.

Methods: Fifteen lung cancer patients previously treated with 3D or VMAT SBRT were randomly selected. VMAT plans are generated using normal and flattening-filter-free (FFF-VMAT) beams. All plans used the same objectives with 5000 cGy to cover 95% PTV. Two dynamic arcs were utilized in each VMAT plan. The couch was set at ± 5 degrees to the straight position for the two non-coplanar arcs. SmartArc was used for VMAT planning. The conformity index (CI), which is the ratio of the total volume receiving at least the prescription dose to the target volume receiving at least the prescription dose and the gradient index (GI) which is the ratio of the volume of 50% of the prescription isodose to the volume of the prescription isodose were compared. The dosimetric comparison also includes the V20 (percentage normal lung volume receiving at least 20 Gy) and V5.

Results: The average and one standard deviation of CI for the 3D, coplanar, non-coplanar VMAT and FFF-VMAT plans was 1.52 ± 0.33 , 1.29 ± 0.21 , 1.28 ± 0.18 and 1.28 ± 0.19 respectively. GI: 8.41 ± 3.78 , 7.42 ± 2.98 , 7.33 ± 3.00 , 7.87 ± 2.79 , indicating sharper dose fall-off in normal tissues in VMAT plans. V20: $7.8 \pm 2.9\%$, $6.9 \pm 2.6\%$, $7.0 \pm 2.6\%$, $6.8 \pm 2.3\%$; V5: $24.8 \pm 8.7\%$, $24.1 \pm 6.5\%$, $23.7 \pm 6.6\%$, $22.5 \pm 6.5\%$; PTV mean dose: 5348 ± 118 , 5294 ± 125 , 5291 ± 117 and 5279 ± 97 cGy. VMAT plans tend to use more MUs.

Conclusions: VMAT plans demonstrated better conformity to target, sharper dose fall-off in normal tissues and smaller V20 and V5 than the 3D plans for lung SBRT while maintaining mean target dose.