

AbstractID: 10377 Title: Improving delivery accuracy of volumetric modulated arc therapy (VMAT)

Purpose: To evaluate the effect of VMAT sequencer, MLC leaf motion range and MU difference for adjacent control points in VMAT plan, and gantry interval used for dose calculation on the treatment delivery accuracy.

Material and Methods: VMAT plans with leaves moving across the field in alternate open-close pattern for every 10 degrees of rotation were created on Pinnacle SmartArc 8.1v and Ergo++ V1.7.1, where VMAT DICOM RT plans were generated with different sequencers. Various MLC motion range and MU with different ratios were assigned to the adjacent control points. The plans were delivered on Elekta Synergy. Measurements with Matrixx ion-chamber array were analyzed. Gamma passing rate were evaluated using dose calculated by interpreting the MU and MLC shapes between control points with different gantry intervals.

Results: DICOM plans transferred from SmartArc had higher gamma passing rate than those from Ergo++. Passing rate decreased as the MU ratio increased for Ergo++ because its VMAT sequencer averaged the MU from two adjacent control points. Less than 2% difference was observed between dose calculated with 1 and 2 degree gantry interval. Compared to plans with 2.5cm MLC motion, passing rate for 5.0cm plans decreased by 5-15%. Verification results degraded as MU ratio increased from 5:5 to 1:9 if dose was calculated using the gantry interval of 2 degrees or larger. Gamma pass rate decreased as the calculation interval increased from 2 to 10 degrees for VMAT plans were calculated assuming MLC leaves were stationary between control points,

Conclusion: Smaller MLC leaf motion range can improve VMAT delivery accuracy. A sequencer capable of keeping original MU for each control point should be used to generate VMAT DICOM RT plan. Fine gantry interval should be used for dose calculation to show the VMAT plan that reflects the delivered dose accurately.

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