

AbstractID: 10973 Title: Influence of gantry angle, multi-leaf collimator (MLC), and jaw position errors to dose distribution in Volumetric Modulated Arc Therapy (VMAT)

Purpose: To establish a machine quality assurance procedure during VMAT delivery.

Method and Materials: A single-arc VMAT plan with 73 control points (CP) and 5-degree gantry angle spacing for a prostate cancer patient has been created by ERGO++ TPS (Elekta, 3DLine). Actual multi-leaf collimator (MLC) and jaw positions, gantry angle and dose rates during prostate VMAT delivery have been recorded in every 0.25 seconds. The dose re-calculation using these recorded data has been performed and compared with the original plan using the gamma index. Calculated dose distributions in the TPS were also compared with irradiated GafChromic films placed inside a plastic phantom on axial, sagittal, and coronal isocenter planes using the same index.

Result: Typical peak errors of MLC position, jaw position, and gantry angle were 3 degrees, 0.6 mm, and 1 mm, respectively. The cumulative MU error was practically negligible because Elekta VMAT delivery was based on MU based servo control. Recalculated dose and original plan agreed well under 2 %-2 mm gamma index criteria. Even in a plan that requires rapid motion of MLCs and jaws, their dynamical parameters were sufficiently well controlled, which was confirmed by comparing film dosimetry and dose calculation with sufficiently small gantry-angle resampling.

Conclusions: Machine quality assurance for VMAT delivery has been performed with a satisfied result.