Purpose: To develop efficient and quantitative commissioning and quality assurance (QA) procedures for volumetric modulated arc therapy (VMAT) with an ion chamber profiler.

Method and Materials: Rotational treatment techniques such as VMAT utilize variable dose rate, gantry speed and dynamic MLC to achieve optimal dose distribution. We designed QA test procedures to check machine output and beam characteristics variation with variable dose rate and gantry speed. MLC leaf positioning accuracy and leaf speed control were also checked. A linear ion chamber profiler was rigidly attached to the gantry head for all measurements. The profiler measured 4 profiles simultaneously: x-axis, y-axis and two diagonal lines. Dose rate was changed with fixed gantry or during arc rotation. Gantry speed was changed by varying the dose rate for the same arc beam delivery. To test MLC movement, MLC openings decreased from 32x32 cm^2 to 4x4 cm^2 during 90^o arc rotation. The arc beam was repeated with same dose rate but different total MU, thereby changing the leaf speed. In each test, machine output and beam characteristics (flatness, symmetry and field width) were evaluated.

Results: Beam remained stable except at very low dose rate (32 MU/min). Output varied from -1.6% to 2.4% at different gantry angles and dose rates. In gantry rotation speed test, gantry speed varies from 0.26 to 8.32 degree/sec. Beam was stable with maximum output change of 0.43%. In MLC leaf test, the difference between measured and expected leaf positions were within 1 mm for all the leaf speeds tested.

Conclusion: The ion chamber profiler is an efficient and convenient tool for quantifying mechanical and dosimetric accuracy for rotational therapy. VMAT machine beam and output are generally stable with variable dose rate and gantry speed. Variations were observed at very low dose rate. MLC leaf positioning accuracy was within tolerance.