AbstractID: 10880 Title: Clinical Implementation and Commission of Volumetric Modulated Arc Therapy

Purpose

Volumetric modulated arc therapy (VMAT) is a rotational IMRT modality that combines dose rate modulation with gantry and MLC motion, thereby increasing the complexity of IMRT delivery. Effective implementation of this technology is still quite new to radiation therapy clinics. This study reports our clinical experience for acceptance testing, commissioning, and routine QA procedure development.

Materials and Methods

VMAT was implemented on a Varian 21EX^{TM} with a Millennium120 MLC and a Novalis Tx^{TM} with a 2.5mm High-Definition MLC. The Eclipse^{TM} treatment planning system was used with the associated ARIA record-and-verify system. Clinical implementation involves (1) measurements of linac parameters and performance such as MLC leaf positioning and motion accuracy, VMAT dosimetric accuracy, and treatment safety checks; (2) planning algorithms and parameters; (3) patient-specific QA studies; and (4) routine QA baselines and procedures.

Results

The difference between planned and measured MLC leaf positions at stationary gantry positions and during VMAT delivery were < 1mm, as measured with film and EPID. The dosimetric accuracy of VMAT delivery was tested with different combinations of gantry speed, dose rate, and MLC motion. Measured variations between these deliveries were < 2%. Guidelines for safe couch positions and placement of immobilization devices were established for both CBCT and VMAT isocenters. The Anisotropic Analytical Algorithm (AAA) dose calculation algorithm was commissioned, with measured point-dose accuracy of better than 2% at central axis and 5% off-axis. Patient specific QA data showed that, for prostate and head-neck cases, point dose accuracy was within 2.5%. Gamma agreements (3mm/3%) > 90% were observed for planar dose distributions measured with an ion chamber array and film.

Conclusion

A methodology for clinical implementation of VMAT is developed. A critical component for implementation is the design of acceptance tests and commissioning protocols which can be used as the baseline for routine QA procedures.