AbstractID: 13966 Title: Flattening filter free IMRT/RapidArc with Trilogy MX linear accelerator

Objective:

To evaluate optimization of flattening filter free (FFF) IMRT/RapidArc in Eclipse treatment planning system (Varian Medical Systems) and to verify performance of Trilogy MX linear accelerator (Varian Medical Systems) delivering these plans.

Materials and Methods:

A diversified group of clinical IMRT/RapidArc plans was optimized using two flattened beams (X6, X10) and two FFF beams (X6FFF, X10FFF) of Trilogy MX accelerator. In order to investigate the influence of high doserates available for FFF beams (up to 1400 MU/min for X6FFF and 2400 MU/min for X10FFF) RapidArc plans for FFF beams were optimized at different maximum doserates. Plans were mutually compared and verified using gafchromic dosimetry.

Results:

A comparable outcome in terms of achieved target coverage and organ sparing is observed for FFF and flattened beams. For RapidArc plans with standard fraction dose, the use of FFF beams can lead to better organ sparing as the optimizer benefits from larger doserate range. For hypofractionated RapidArc treatments, significant treatment time reduction (more than factor 4) can be achieved. For sliding window IMRT, doserate needs to be selected in proportion to fraction dose. Gafchromic film verification of the plans delivered by Trilogy MX shows an excellent agreement with the calculated dose distribution for all four energies. Large reduction of scattered radiation has been measured for FFF beam based plans.

Conclusion:

While IMRT and RapidArc plans based on flattened and FFF beams lead in general to comparable dose distributions, there is a significant reduction of scatter radiation and more time-efficient delivery achieved for FFF beams.