AbstractID: 4819 Title: Dose Rate Optimization for Intensity Modulated Arc Therapy

Purpose: We use multiple dynamic arcs with different MLC shapes at different gantry angles for Intensity-modulated arc therapy (IMAT). This study is to develop a fast and simple algorithm to optimize the dose rate as a function of gantry angle for IMAT for linear accelerators with dose rate variation capability for a dynamic arc.

Method and Materials: The dose rate as a function of gantry angle for a dynamic arc is expressed by an analytical expression that favors beam directions with lower dose deposited to critical structures and higher dose deposited to the target volume. Three parameters are included in the analytical expression for further optimization of the dose rate base on an objective function. The optimized plan is transferred to a forward treatment planning system for final dose calculation. The method is applied to a phantom and a few clinical cases using 6 MV and 18 MV beams for a Varian linear accelerator.

Results: The method has been demonstrated with a test phantom and a few clinical radiotherapy cases. We have showed that dose distributions and dose volume histograms have been improved with the dose rate optimization for IMAT. It gives more uniform dose to the target volume and lower dose to the critical structure.

Conclusions: We have developed a fast and simple technique to optimize the dose rate as a function of gantry angle for intensity-modulated arc therapy, while retaining its advantages of an intuitive treatment planning process and efficient radiation delivery.