AbstractID: 14021 Title: Comprehensive study of parameters for volumetric modulated arc therapy (VMAT) treatment planning

Purpose: VMAT is a rotational IMRT technique that uses a traditional linear accelerator gantry with a dynamic MLC, variable dose rate, and variable gantry speed. The Pinnacle^3 SmartArc treatment module has been implemented in our clinic for VMAT treatment planning. However, it was unclear how SmartArc planning parameters affected the overall plan quality. The purpose of this study was to systematically examine all planning parameters and quantify the effect of varying each on the quality of a baseline plan.
Method and Materials: In this study, parameters were separated into two categories: commissioning parameters and planning parameters. Commissioning parameters are those that are available to the user during the machine commissioning process in Pinnacle, *i.e.* dose rate, gantry speed, MLC size, and MLC speed. Planning parameters are those that are available to the user during treatment planning, *i.e.* beam energy (6, 10 or 15 MV), collimator angle, arc length, and final gantry spacing. A baseline set of planning parameters was established that provided ±3% and ±5% dose homogeneity in the PTV of a cylindrical phantom a prostate patient, respectively. Each parameter was independently varied while keeping all other parameters set to the baseline values. The resulting plans were evaluated using dose volume histograms, dose homogeneity indices (DHI), and normal tissue dose metrics.
Results: The DHI for the prostate baseline plan was 0.073. Changes to the collimator angle and the total arc length had the greatest influence on DHI, which ranged from 0.073-0.099 and 0.073-0.390, respectively. Parameters such as MLC leaf size, gantry speed, and whether the dose rate was continuously or discretely variable had little effect.
Conclusion: Most SmartArc parameters had little effect on dose homogeneity and normal tissue sparing. The most notable changes in plan quality came from varying the collimator angle and the total arc length.