

AbstractID: 13676 Title: Assessment of Volumetric Arc Therapy Plans for Constant and Variable Dose Rates

Introduction: Recently, volumetric arc therapy (VMAT) that combines dynamic gantry motion with beam intensity modulation has become clinically available for planning and delivery of dynamic arc IMRT treatments. During VMAT optimization process, several parameters can be changed, including gantry speed and dose rate. The goal of this work was to assess the differences between the VMAT plans generated with constant and variable dose rates.

Methods and Materials: Patients with H&N cancer who were treated with step-and-shoot IMRT (DMPO) were selected for this study. Plans were generated using Pinnacle's Smart Arc software which supports generation of both constant and variable dose rate VMAT plans. VMAT plans for 100 - 500 constant dose rates (DR) and variable dose rate were generated. Plans consisted of two 360° arcs with 4° arc sampling. Plans were compared using DVH parameters for target(s) and OARs and MUs. VMAT plans were also verified in a cylindrical phantom using film and ion chamber.

Results: The MUs for DR=100 were 22% lower as compared to the DMPO MUs and increased with the increasing DR. The MUs for DR=400, however, is 21% higher than the DMPO MUs. The MUs for variable dose rate is the lowest (581MUs) as compared to 100 dose rate plan (832MUs). PTV coverages were almost the same up to DR=300 and degraded significantly for 400, 500 and 600. Phantom verification of all plans showed that the calculated and measured ion chamber doses at isocenter were within 4%.

Conclusion: This study showed that the constant dose rate VMAT plans up to 300 produced similar plans to the ones obtained with variable dose rate and DMPO plans, in terms of target coverage and critical structure sparing. However, variable dose rate plans still the choice in terms of MU efficiency and plan quality.