AbstractID: 11423 Title: A comparison of treatment planning and delivery of VMAT using anatomy-based and fluence-based inverse planning with step and shoot IMRT

Purpose: In this study, we compare the plan quality, treatment delivery efficiency and accuracy of VMAT and fixed-field IMRT. VMAT plans were created using both anatomy-based and fluence-based inverse planning techniques.

Method and Materials: Nine cases including 3 prostate, 3 pancreas, 2 head and neck (HN) and 1 brain were selected for this study. The patients were previously treated with step-and-shoot IMRT plans developed in the CMS Xio treatment planning system (TPS). For each case, two VMAT plans were generated retrospectively. The first VMAT plan was generated using ERGO++ R1.7 TPS (Elekta), which uses an anatomy-based inverse planning method. The second VMAT plan was generated by converting the optimized fluence maps calculated by the Pinnacle^3 TPS into deliverable arcs using an in-house arc sequencer. VMAT plans were verified on an Elekta Synergy and plan comparisons were made in terms of delivery efficiency and accuracy.

Results: For pancreatic, prostate and brain cases, anatomy-based VMAT provided comparable target coverage and sparing of OARs as compared with fluence-based VMAT and fixed-field IMRT. For HN, fluence-based VMAT improved target coverage and sparing of OARs compared with anatomy-based VMAT and IMRT. For the 9 cases tested, the mean delivery time for the fluence-based VMAT was 20% less than the anatomy-based VMAT and 78% less than IMRT. The number of monitor units for the anatomy-based VMAT was approximately 10% less than fluence-based VAMT and 56% less than IMRT. The average passing rates for the plan QAs were 98%, 99% and 91% for IMRT, fluence-based VMAT, and anatomy-based VMAT, respectively.

Conclusion: VMAT is able to reduce treatment times by 70% while producing equivalent or better dose distributions as fixed-field IMRT. For challenging HN cases, VMAT using a fluence-based inverse planning method improves the dose distribution quality as compared with IMRT and anatomy-based VMAT.

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