AbstractID: 10692 Title: The inter- and intra-fraction reproducibility of three common IMRT delivery techniques

Purpose: To investigate and compare the inter- and intra-fraction reproducibility of three popular methods of IMRT delivery: step-and-shoot, sliding window, and solid compensator delivery. **Method and Materials:** A seven-field IMRT plan for a head and neck case was created using the Pinnacle^3 treatment planning system (TPS). The intensity maps were realized using solid compensators and MLC segments. The IMRT QAs were measured using the MatriXX and Kodak EDR2 film. The plans were delivered on 10 consecutive days and the first delivery was used as reference. Each delivery was evaluated using gamma index, profiles and isodose distributions. Dose rate, the number of MUs per segment and two gantry angles (90 or 180 degrees) to study gravity effects on the MLC were investigated. **Results:** Both the compensator and MLC-based fields have results that are within the clinically acceptable tolerance of 3% dose difference, 2mm DTA and gamma value less than 1 (95% of the pixels). However, when using stricter criteria: 2%, 2mm, and gamma tolerance of 0.5, it becomes clear that the compensator based delivery has a definite advantage over comparable MLC-based competitors in terms of inter-fraction reproducibility. It was observed that the increase in dose rate or the increase of MU/segment degrades the quality of the plan. Gravity did not affect the MLC delivery. **Conclusion:** The inherent baseline resolution of the compensators is better than that of the MLC modulated fields based solely on the methods used to generate the modulations themselves. The inter-fraction reproducibility is as good, and often better, than delivery with the MLCs. Fewer monitor units are required to deliver each portal, and thus patient outcomes can be improved and unwanted side effects to both patients and therapists can be reduced.

Conflict of Interest (only if applicable): .decimal Inc supported the investigation.