

AbstractID: 11209 Title: The dependence of IMRT plans on the maximum number of segments

Purpose: Pinnacle3 provides an direct aperture based step-and-shoot IMRT optimization algorithm, so called direct machine parameter optimization (DMPO). This algorithm is known to result in better plan quality with less monitor units than the previous two-step optimization. Here, we present the dependence of the IMRT plan quality on the maximum number of segments. **Method and Materials:** Pinnacle3 (ver 7.4f) with a DMPO option was used for the IMRT plan of the five hypopharyngeal cases. The planning system had been commissioned for a Varian 21-EX with 120 multileafs upon which larger fields are split into smaller ones due the MLC span limitation. PTVs were contoured for 66 Gy, 59.4 Gy and 56.1 Gy with 33 fractionations. Critical organs delineated were as follows: cord, brain stem, inner ears, parotid glands, and cavity for mucosa. Three-fold dose shaping rings encompassing the PTVs were also added and seven beams were used. Plans were generated for the number of segments between 20 to 80 and evaluated based on the plan with 80 segments. **Results:** As the number of segments decreased, the plans generally showed a) a tendency of adopting smaller monitor units, b) a wider low dose region, and c) a more inhomogeneous target dose distribution. However, the IMRT plan for the hypopharyngeal case showed similar DVHs and dose distributions down to 40 segments, which amounts to three segments per beam in average after beam splitting. **Conclusion:** With the DMPO option, unexpectedly smaller number of segments were found to be enough for the clinically acceptable IMRT plan. We plan to extend this study to nasopharyngeal and maxillary cases. With the evaluation of the plan quality along with the segments, more economical IMRT plan and beam delivery would be possible.