

AbstractID: 11518 Title: Comparison of IMRT planning with two-step and one-step optimization: strategy for improving therapeutic gain reducing integral dose

**Purpose:** Intensity-modulated radiotherapy (IMRT) plans are often complex and time consuming both in the optimization and delivery phase, the latter increasing the potential for dosimetric errors. The purpose of this study is to evaluate the effectiveness and efficiency of one-step optimization with step-and-shoot technique as compared to conventional two with sliding windows technique optimization in inverse IMRT planning.

**Material and methods:** The approach generally employed to generate the photon fluence maps is a two-step process: first the optimization problem is solved generating an ideal matrix of photon fluence, then the fluence profiles are converted into a deliverable photon fluences through a sequencer software using step-and shoot or sliding window modality of multi-leaf collimators. Machine parameters can be considered directly in direct machine parameter optimization (DMPO) or in the conversion phase in the two step approach. The Pinnacle IMRT TPS allows both approach. One-step plans had the maximum number of segments set at 50, 70, 90. Two-step plans were produced using ideal fluence, with or without smooth filter, converted into a sliding windows sequence. Moreover, the plans were generated allowing or not the split of the beams.

**Results:** All plans showed similar target coverage. Compared to traditional two-step optimization and dynamic modality, DMPO plans resulted in lower MUs, and lower doses to sensitive structures as well as Normal Tissue Complication Probability. The total MUs and the integral dose were lower for plans with the splitted than the no splitted beams.

**Conclusion:** One-step optimization is an effective and efficient method for simplifying IMRT plans.