

**Purpose:** To explore similarities between intensity modulated radiotherapy (IMRT) and intensity modulated arc therapy (IMAT) techniques in the context of the number of multi-leaf collimator (MLC) segments required to achieve plan objectives, the major factor influencing plan quality.

**Materials and Methods:** Three clinical cases with increasing complexity were studied: (a) prostate only, (b) prostate and seminal vesicles, (c) prostate and pelvic lymph nodes. Initial “gold-standard” plans with the maximum possible organ-at-risk sparing were generated for all three cases. For each case, multiple IMRT and IMAT plans were generated with varying intensity levels (IMRT) and arc control points (IMAT), which translates to varying MLC segments in both modalities. The IMAT/IMRT plans were forced to mimic the organ-at-risk sparing and target coverage in the gold-standard plans, thereby only allowing the target dose inhomogeneity to be variable. A higher target dose inhomogeneity (quantified as D5 – dose to the highest 5% of target volume) implies that the plan is less capable of modulation.

**Results:** For each case, given a similar number of MLC segments, both IMRT and IMAT plans exhibit similar target dose inhomogeneity, indicating there is no difference in their ability to provide dose painting. Target dose inhomogeneity remained approximately constant with decreasing segments, but sharply increased below a specific critical number of segments (70, 100, 110 for cases a, b, c, respectively).

**Conclusions:** For the cases studied, IMAT and IMRT plans are similar in their dependence on the number of MLC segments. A minimum critical number of segments is required to ensure adequate plan quality. Future studies are needed to establish the range of minimum critical number of segments for different treatment sites and target-organ geometries.

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