

AbstractID: 11517 Title: Alternative delivery approach for RapidArc using constant dose rate

Purpose: Varian RapidArc™ is a new treatment technique that delivers conformal dose distributions to the target in one single gantry rotation. The segments in the treatment arc are allowed to have different monitor unit (MU) weightings requiring variable dose-rate (VDR) for delivery. An alternative delivery approach for (VDR) RapidArc plans that utilizes constant dose-rate (CDR) was developed.

Method and Materials: For four patient cases (two head-and-neck (HN), one brain, one prostate), RapidArc plans were generated using the Eclipse treatment planning system. The resultant VDR treatment plans were converted into CDR plans by re-distributing the equi-spaced segments in the VDR arc such that the segments with larger MU weighting occupy a greater angular interval. To minimize perturbation from the optimized dose distribution, the angular deviation of the segments was restricted to 5°. This restriction requires the treatment arc to be broken into multiple sectors such that the local MU fluctuation within each sector is reduced, thereby lowering the angular deviation of the segments during re-distribution. The converted broken-sector CDR (b-CDR) plans were delivered with a single gantry sweep as in the VDR plans but each sector was delivered with different values of CDR.

Results and Conclusion: For plans with complex angular MU distribution, the number of broken sectors may increase in the b-CDR plans in order to maintain the original plan quality. All b-CDR plans produced similar dose distributions to the VDR plans by dissecting the arc up to 5 sectors. On average, the delivery times of the b-CDR plans were 1 minute longer than that in the VDR plans. Since the majority of treatment time is spent on the patient setup, these results show that VDR RapidArc plans can be delivered using CDR without significantly compromising the plan quality or treatment efficiency.

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