Freedom from Conventional: Application of RapidArc for SBRT Lung Treatments

Innovation/Impact: RapidArc possesses the ability to deliver stereotactic body radiation therapy (SBRT) in a manner that compares favorably in dosimetry with conventional, multiple static field beam arrangement and significantly reduces treatment delivery time.

Introduction: The accepted planning and delivery method in treating SBRT lung patients at our institution is 8-10 conformal, static fields in coplanar and non-coplanar arrangements. The inception of RapidArc has enabled the evaluation of using this modality in SBRT lung treatments. This presentation will display the ability of RapidArc to deliver either a conformal, uniform dose distribution or replicate the dosimetry achieved by multiple, conformal field SBRT.

Methods and Materials: We investigated 12 prior patients who have received SBRT treatment for early stage lung lesions. Originally treated plans utilized 8-10 conformal static coplanar and non-coplanar fields; a treat-to of about 75% was prescribed to deliver the prescribed dose to 95% of the PTV volume. For each patient, several RapidArc plans were generated to evaluate the benefits of each setup. RapidArc plans fell into four categories: single, 210° coplanar arc; dual, 180° coplanar arcs; dual, 180° non-coplanar arcs; dual, 160° coplanar arcs with a 40° non-coplanar arc. Plans were optimized to deliver a uniform dose distribution across the PTV or recreate the dosimetry associated with conventional SBRT. Angular restrictions were utilized to limit dose to the contralateral lung and spare nearby critical structures.

Case Study: The following example displays the freedom with which RapidArc provides users with in planning and delivery of SBRT lung cases. Case 1 (figure 1) illustrates the ability to recreate the dosimetry of a multiple conformal field SBRT plan with a dual 180 degree, coplanar RapidArc plan. The original 10-field SBRT treatment required a treat-to of 79% to deliver 5000cGy to 95% of the volume of the PTV. The RapidArc plan was optimized to deliver the prescribed dose to the PTV and set an upper limit of 6500cGy to the target volume. The DVH illustrates the similarities in dose deliverance to the PTV and GTV between the two plans. The RapidArc plan achieves greater conformity, as C100% and D2cm were improved via RapidArc (1.17 and 53%) from the originally treated conventional plan (1.27 and 68%). The conventional SBRT delivery averaged 14 minutes in duration, neglecting imaging; the coplanar, dual arc plan has been estimated to deliver the prescribed dose in less than 5 minutes.

Conclusion: RapidArc provides greater freedom in the planning of SBRT lung cases, as plans can be optimized to deliver conformal, uniform dose distributions or mimic the dosimetry of conventional, multiple static field SBRT.