

Purpose: To assess the dosimetric characteristics of volumetric intensity-modulated arc therapy (Rapid Arc) versus traditional anterior-posterior beam arrangement with kidney blocks, and to demonstrate the feasibility of whole-abdominal rapid arc being used in a routine clinical setting.

Methods: A rapid arc plan was optimized (with 3 isocenters and 6 arcs) and a traditional AP/PA plan was generated with posterior kidney blocks for a patient prescribing 30 Gy to the whole abdomen. Both plans were copied onto a Rando phantom and optically stimulated luminescent detectors (OSLs) were placed on the phantom to measure the dose delivered by a Varian TrueBeam linac. OSLs were also placed on the patient and the measurements were evaluated. Pre-treatment quality assurance was evaluated utilizing the Octavius QA device and analyzed using the criteria of 3%/3mm threshold for the gamma index.

Results: Mean dose to PTV with rapid arc was 28.3Gy and with AP/PA was 28.5Gy. Target homogeneity was improved for the rapid arc plan. For organs at risk, the dose to the bone marrow was $V90\% = 18.4\%$ in the rapid arc plan and $V90\% = 95.13\%$ in the AP/PA plan. Mean doses to the kidneys were comparable in both plans. The OSL results were within 3% for the phantom study and within 6% for the patient measurements. Pre-treatment QA passed with gamma index in the range of 93.9%-99.4% for all the arcs.

Conclusions: Rapid arc is a feasible alternative to the traditional therapy. Rapid arc for whole abdominal irradiation in patients offers better homogeneity with the same level of kidney sparing while providing more sparing of organs at risk, such as the bone marrow.