

Volumetric modulated arc therapy (VMAT) is a novel extension of conventional intensity-modulated radiotherapy (cIMRT), in which an optimized three-dimensional dose distribution may be delivered in a single gantry rotation. VMAT is the predecessor to RapidArc (Varian Medical System). Leaf positions and segment weights (control points) are directly optimized, and a variable dose rate is used. RapidArc incorporates capabilities such as variable dose-rate, variable gantry speed, and accurate and fast dynamic multileaf collimators (DMLC), to optimize dose conformality, delivery efficiency, accuracy and reliability. Tests have been designed that evaluate RapidArc performance in a stepwise manner. The accuracy of DMLC position during gantry rotation, the ability to vary and control the dose-rate and gantry speed and, the combined use of variable DMLC speed and dose-rate can be independently tested. Similar to IMRT with static gantry angles and set dose rate, the RapidArc deliveries require patient specific QA. The evaluation between measured and calculated dose is essential in the patient specific quality assurance procedures for intensity modulated radiation therapy. The high complexity of volumetric arc radiotherapy delivery attributed to the dynamic and synchronization requirements of such delivery require new methods and potentially new tools for the quality assurance of such techniques. Studies evaluating the dosimetric performance of EDR2 film and commercially available quality assurance devices have been performed in our institution. Our results showed that differences between the detector systems are small. The respective gamma index histograms showed that when 3% dose difference and 3mm distance to agreement are used, more than 90% of the evaluated points were within the tolerance criteria. Most of the dosimetric systems under investigation can be used interchangeably for routine patient specific QA with RapidArc.

Educational objectives:

- Understand RapidArc delivery and its complexity
- Understand the need of RapidArc commissioning and periodic QA
- Understand the need of patient specific QA