A study on dosimetric properties of electronic portal imaging device and its use as a quality assurance tool in Volumetric Modulated Arc Therapy
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ABSTRACT

Aim: In this study, the dosimetric properties of the electronic portal imaging device were examined and the quality assurance testing of Volumetric Modulated Arc Therapy was performed.

Background: RapidArc involves the variable dose rate, leaf speed and the gantry rotation. The imager was studied for the effects like dose, dose rate, field size, leaf speed and sag during gantry rotation.

Materials and methods: A Varian RapidArc machine equipped with 120 multileaf collimator and amorphous silicon detector was used for the study. The characteristics that are variable in RapidArc treatment were studied for the portal imager. The accuracy of a dynamic multileaf collimator position at different gantry angles and during gantry rotation was examined using the picket fence test. The control of the dose rate and gantry speed was verified using a test field irradiating seven strips of the same dose with different dose rate and gantry speeds. The control over leaf speed during arc was verified by irradiating four strips of different leaf speeds with the same dose in each strip. To verify the results, the RapidArc test procedure was compared with the X-Omat film and verified for a period of 6 weeks using EPID.

Results: The effect of gantry rotation on leaf accuracy was minimal. The dose in segments showed good agreement with mean deviation of 0.8% for dose rate control and 1.09% for leaf speed control over different gantry speeds.

Conclusion: The results provided a precise control of gantry speed, dose rate and leaf speeds during RapidArc delivery and were consistent over 6 weeks.

Keywords: RapidArc; Picket fence; EPID; Quality assurance; Leaf speed; Dose rate