Purpose: Varian RapidArc is a volumetric arc therapy (VMAT) that obtains a conformal dose around the desired structure by employing variable gantry speed, dose rate, and dynamic multileaf collimator (DMLC) speed as the gantry rotates about machine isocenter. This study is meant to build upon previous research by Ling et. al. by completing the tests with an in vivo dosimetric device attached to the linac gantry.

Methods: The PTW DAVID detector was attached to the linear accelerator gantry, which allows it to remain perpendicular to the beam at all gantry angles. Three tests for RapidArc evaluation were performed on this device including: dose rate and gantry speed variation, DMLC speed and dose rate variation, and DMLC position accuracy. The reproducibility of the arc data was also reported.

Results: A picket fence plan varying dose rates from 111 to 600 MU/min and gantry speeds from 5.5 to 4.3 degrees/s was delivered consisting of seven sections of different combinations. These measurements were compared to static gantry, open field measurements and found to be within 2.39% (2.23-2.39%). A four-section picket fence for DMLC speeds of 0.46, 0.92, 1.84, and 2.76 cm/s was similarly evaluated and found to be within 1.99% (1.86-1.99%). For DMLC position accuracy a picket fence arc plan was compared to a static picket fence and found to agree within 0.38% (0.31-0.38%). Reproducibility for these three RapidArc plans was found to be within 0.19%, 0.16%, and 0.30% respectively.

Conclusions: The DAVID detector was able to measure the RapidArc quality assurance plans accurately and was found to produce reproducible data. Testing the main three elements of variation for RapidArc delivery is a necessary component of VMAT evaluation and this device allows for a time efficient method of doing so.

Funding Support, Disclosures, and Conflict of Interest:

This work has been partially funded by PTW, Freiburg, Germany.