Purpose: Wide spread clinical use of advanced radiation treatment delivery techniques such as volumetric modulated arc therapy (VMAT) and IMRT needs an easy-to-use, well-defined, and effective quality assurance (QA) system to ensure the accuracy of dose delivery. The comprehensive evaluation of two delivery QA systems (DQA) (Portal Dosimetry and Compass) for the advanced radiation delivery techniques is necessary for the clinical setting.

Methods: Portal Dosimetry QA system with Varian PortalVision (PV) provides a quantitative comparison of measured electronic dose profile to a predicted dose profile with Varian's Eclipse treatment planning system (TPS) for the VMAT and IMRT plans. Quantitative comparisons of the two images, including dose difference, gamma analysis, points dose measurements, and line profiles are easily acquired in two dimensions. Meanwhile, Compass system with MatriXX can provide an accurate three-dimensional quantitative analysis of dose delivery. We applied the two planning QA systems to our RapidArc patient-specific QAs. Validation of the Compass and Portal Dosimetry systems were performed with ionization chamber measurements for absolute dosimetry and film measurements for gamma index calculations for phantom and patient treatment plans.

Results: Compass system was very sensitive to the MLC leaf gap variations in three dimensional gamma analyses. However, Compass system was not enough to fix the errors in dosimetric leaf gap by itself. DQA process with Portal Dosimetry took approximately 6 minutes for the two Arcs VMAT plan. Compass took about 40 minutes for the same plan in our first clinical trial. For the three typical IMRT and VMAT plans, the two systems showed the same passing rates in 95% pixels passing gamma criteria 3%/3mm.

Conclusions: Portal Dosimetry DQA system has the advantages of effectiveness and practicality in the clinical setting. On the other hand, Compass was the next supportive system because of its accuracy and reality with patient’s anatomy.