Comparison of Measurements From Two Diode Array QA Devices to Deep Point Dose Measurements with Two Treatment Planning Model Settings for Brain VMAT SRT Patient-Specific QA

Presentations
SU-F-T-311 (Sunday, July 31, 2016) 3:00 PM - 6:00 PM Room: Exhibit Hall

Purpose: To investigate the sensitivity of traditional gamma-index-based analysis using diode arrays to detect significant dosimetric errors in patient-specific measurements for VMAT brain SRT plans.

Methods: Quality assurance measurements were performed using an ion chamber and two different diode array devices for four brain SRT treatment plans. All cases were planned with Eclipse AAA RapidArc using 6MV VMAT for a TrueBeam STx. Ion chambers measurements were performed with a PinPoint 3D micro-ion chamber in both the Standard Imaging Stereotactic Dose Verification (SI) Phantom and in the ArcCheck (AC) cavity plug. Point dose measurements were taken at isocenter within the target. Array measurements were acquired with the ArcCheck and gantry-mounted MapCheck (MC) and assessed using the SNC patient software with a 3%/3mm absolute dose gamma-index analysis with global normalization and a 10% dose threshold. Calculations and their corresponding measurements were performed and compared before and after a dynamic leaf gap (DLG) adjustment.

Results: The measured doses at isocenter dropped from 6.3%-8.7% in the SI phantom and 4.0%-9.3% for AC down to -0.1%-1.1% in the SI phantom and 0.8%-2.9% in the AC after adjusting the DLG. However, the cumulative dose differences to MC’s central diode ranged -2.0%-1.9% before the DLG adjustment and were -7.7%-0.2% afterwards. Similarly, the gamma-index analysis results for MC were found to be 94.1%-100% before the DLG adjustment and 94.4%-100% afterwards. The gamma-index results from AC were 72.9%-98.7% before and 95.9%-99.7% after.

Conclusion: Our data suggest that traditional passing criteria using gantry-mounted MapCheck may not have the sensitivity to catch significant dose errors introduced by DLG settings. ArcCheck measurements did flag some dose differences, however there appears to be a possibility that dose discrepancies may not always be observed for VMAT SRT treatments, and point dose measurements are recommended for verification.