Initial Assessments of Delta4 Insight, a Monte Carlo-Based Second Check Software

Su FC[1], Li X[1], Zhao H[1], Bhagroo S[1], Rassiah P[1], Salter B[1], Sarkar V[1]
[1]University of Utah, Huntsman Cancer Institution

Purpose: To demonstrate the improved functionality of Delta4 TPV[*] (Scandidos AB), a Monte Carlo-based secondary dosimetric module

Methods: Delta4 TPV provides a Monte Carlo calculation module that automatically performs secondary 3D dose assessments and gamma analyses on target and normal tissue structures. We selected 12 VMAT plans that were planned with flattened and flattening-filter-free photon beams for an initial evaluation of the software. The plans were calculated using Eclipse AcurosXB (version 15.5) algorithm with Millennium 120 or HD MLC (Varian TrueBeam). We evaluated various treatment sites, including one head-and-neck, one abdomen, three pelvic, three brain, and four lung cases. We performed point dose verifications compared to the results of RadCalc. Further, overall volumetric dose comparisons were assessed through gamma analyses (3%, 3mm, 20% low-dose threshold). Additionally, with the export function of TPV 3D dose volumes, dosimetric assessments of DVH metrics were performed in RayStation (version 11A).

Results: 10 of 12 (83%) plans showed better agreement between Delta4 TPV and Eclipse AcurosXB than with RadCalc for point dose comparisons. The range of point dose deviations increased from between -1.8% and 3.3% for TPV to between -2.3% and 6.3% for RadCalc. As for 3D evaluations, the mean pass rate of gamma analyses was 99.0%. Evidence showed the largest variations in D99%, between TPV and AcurosXB, increased from -3.4% for the averaged 20 targets to -8.1% for the lung targets only.

Conclusion: This initial evaluation of Delta4 TPV showed improved overall dosimetric assessments in complex plans. It is a Monte Carlo-based, 3D software that provides more accurate and comprehensive dose evaluations than the existing method using modified Clarkson integration algorithm. We plan to further assess SBRT lung and SRS brain AcurosXB plans using TPV because such plans require more accurate secondary dose verifications due to higher heterogeneity and smaller field

[*]The software is now named Delta4 Insight