Purpose: Three-dimensional (3D) dosimetry systems are rapidly improving, and provide vastly more data and comprehensive QA than can be achieved with conventional dosimetry systems. New challenges emerge including how best to utilize this data. Here we present a method to transform the measured 3D dose in phantom, back to the planning CT, such that measured patient DVH's can be obtained. The significance is the method enables clinical interpretation of QA, through comparison of planned and measured DVH in patient.

Methods: The DLOS/Presage 3D dosimetry system was used to verify the dose delivered for 6 stereotactic, fractionated, base-of-skull radiosurgery treatments. Each plan was recalculated (fluence maps unchanged) and delivered to the RPC H&N IMRT credentialing phantom, containing a cylindrical Presage dosimeter 10cm diameter. The measured and planned dose distributions were compared in phantom. The measured dose-distributions were then transformed back to the planning CT's, using an algorithm that comprehensively models heterogeneity differences. Measured and planned DVH and dose distributions were compared in patient.

Results: Measured dose distributions with 2mm3 isotropic resolution were acquired for all 6 test cases. Excellent agreement was found between the measured and planned dose-distributions in the phantom. Average 3D gamma passing rate (3%, 3mm criteria) was 95%. When the distributions were transformed back to the planning CT, measured DVHs showed close agreement with the planned DVH for all cases. Differences were observed, however, and will be discussed. The accuracy of the transform algorithm was investigated in simulations.

Conclusions: In the event of a delivery error, the uncertainty in the transform algorithm is small (< 1%), significantly less than the magnitude of error to be detected. The DLOS/Presage system performed at a consistently high level, consistent with prior benchmarking studies. The ability to generate measured patient DVH's represents an important advance in treatment verification.

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