AbstractID: 7120 Title: Comparison of 3D dose measurements in ferrous xylenol orange gel with Mapcheck diode array and Pinnacle3 dose calculations

Purpose: To compare 3D dose distributions calculated using the Pinnacle^3 (Philips Medical Systems) planning system and measured with a Mapcheck^{TM} diode array with those obtained by independent sets of ferrous xylenol orange (FX) gels scanned optically.

Methods: A beam for a clinical IMRT plan with a small planning target volume (PTV) was recalculated using Pinnacle^3 (1x1x3 mm voxels) for delivery to a uniform flat water phantom with the linac (Varian Clinac 2100EX) gantry stationary at 0°. The beam was delivered to Mapcheck^{TM} (Sun Nuclear Corporation) with a sequence of overlaying plastic sheets to acquire planar doses from depths of 20 to 70mm (5mm increments). Two FX gels were also irradiated with the IMRT beam and scanned optically with an in-house laser CT scanner and a commercial cone beam CT scanner (Vista™, Modus Medical Devices Inc.), respectively. A second pair of FX gels was irradiated with a 12MeV electron beam (Varian Clinac 2100C) to provide independent dose calibrations for the two scanners. Optical-CT reconstruction data at 0.125mm^3 resolution were averaged to 1mm^3 voxels for comparison. Mapcheck^{TM} dose points were linearly interpolated to provide additional points for comparison.

Results: Laser CT and cone beam CT (Vista™) scanning of FX gels provided similar dose distributions. In comparable slices, the doses were in agreement to within 3% of Mapcheck™ results. Agreement within 2% in dose was achieved for the four independent systems at a 50 mm depth. However, at shallow depths (<30mm) the Pinnacle^3 calculation results were greater than the measured doses by up to 7%.

Conclusions: FX gel dosimetry provided full 3D dose distributions with 0.5 mm^3 resolution and dose at equivalent points agreed favourably with Mapcheck^{TM} readings.

Conflict of interest: Two of the authors (KJ, JB) have a licensing agreement with Modus Medical Devices Inc. concerning the commercialization of Vista™.