AbstractID: 8396 Title: Evaluation of a novel 3-D polymer gel dosimetry system for proton radiotherapy

Purpose: Preliminary evaluation of a novel, large-volume (2.2 liter), 3D polymer gel dosimeter (BANG®-3-PRO) developed for proton radiotherapy dosimetry is presented. The characteristics of dose response and its linear energy transfer (LET) dependence are addressed. The performance of the dosimeter is analyzed under the conditions of pristine and clinically relevant beam configurations. The ability to visualize and analyze proton dose distributions in 3D is demonstrated. **Methods and Materials:** The dosimeters were read out using a characterized optical computed tomography scanner. The calibration was performed by correlating the change in optical density along the beam axis to the depth-dose curve from a pristine proton beam delivery (28.4 cm range, 4.5 cm circular aperture) obtained using ion-chamber measurements. To exclude the potential LET dependence, only the plateau region was used. Several pristine-beam and spread-out Bragg peak (SOBP) dose distributions were recorded and compared to ion-chamber measurements, including the assessment of dose response in high-LET regions. A volumetric dose distribution delivered using a pristine beam and an irregularly shaped aperture was recorded and reconstructed in three dimensions. **Results:** The dose response of the gel was linear in the studied range (25-150 cGy). Dose profiles from the gel showed good general agreement with ion chamber measurements, with excellent positional reproducibility of the distal and proximal edges along and perpendicular to the beam direction. In the case of SOBP delivery (140 cGy peak dose), no response quenching in the peak region (characteristic of other dosimeter types) was observed. For a pristine beam delivery (170 cGy peak dose), the gel dosimeter demonstrated a ~10% under-response at the Bragg peak (BP). **Conclusion:** Preliminary investigations suggest that this 3D dosimeter is capable of reproducing proton beam dose distributions with high spatial accuracy, with little or no quenching at the BP or SOBP.