

AbstractID: 6880 Title: 3D characterization of small megavoltage radiation fields using an optical CT scanner with radiochromic gels

Purpose: To investigate the feasibility of using a 3D dosimetry system consisting of a radiochromic ferrous xylenol orange (FX) gel and a prototype commercial cone beam optical-CT scanning system (Vista™, Modus Medical Devices, Inc., London, ON) to dosimetrically characterize small megavoltage photon fields. Method and Materials: An FXG gel was irradiated using 6MV x-ray fields (30, 10 and 5mm diameter) produced via custom stereotactic collimators mounted on a Varian Clinac 2100EX accelerator. Measurements were also completed using radiochromic (Gafchromic EBT) and radiographic (Kodak EDR2) film, and a Exradin A1SL ion chamber for comparison purposes. The gel was optically CT scanned 10, 20, 30 and 40 minutes post-irradiation to assess the effects of xylenol orange/ferric ion complex diffusion in gel. Lateral dose profiles and percentage depth dose (PDD) curves were extracted from the 3D image data sets for analysis. Results: FX gels together with fast optical CT scanning allows for the measurement of all dosimetric parameters required as pencil beam input for treatment planning systems in a single irradiation. The experimental set-up is simple, and the gel allows for dose measurements in a tissue-equivalent and energy-independent medium. Lateral beam profiles as measured in the FXG gel matched those measured using both types of film within 2 mm. PDD curves measured with gel and ion chamber were also in good agreement (within 3 mm) up to 65mm depth. Conclusion: The radiochromic FX gel and fast optical CT scanner is a promising dosimetry system for the characterization of small x-ray fields for the purposes of commissioning treatment planning systems. The advantage is that a full 3D data set can be acquired quickly and efficiently. Conflict of Interest: Two of the authors (KJ and JB) have a licensing agreement with Modus Medical Devices, Inc. for the commercialization of the Vista™ scanner.