

AbstractID: 5314 Title: Assessment of Dental Amalgam Backscatter with a Beacon Transponder Embedded Mouthpiece for Real-Time Tracking during Head and Neck IMRT

Purpose: A mouthpiece embedded with Beacon® transponders (Calypso Medical) for continuous localization and tracking during IMRT head and neck irradiation was evaluated for backscatter to the oral mucosa. Dental amalgam can generate excessive backscatter dose to the oral mucosa during treatment. Study objectives were to measure backscatter dose from amalgams, transponders and mouthpiece relative to the oral mucosa.

Method and Materials: A dental phantom having 16 of 28 teeth containing amalgam, and a prototype acrylic mouthpiece embedded with 3 transponders (1mm depth) were fabricated. To simulate overlying oral mucosa, a 1.5cm bolus was placed over the dental phantom and mouthpiece for baseline measurements. A TN502RD MOSFET dosimeter and TLD chips (3x3x1mm) with a 6 MV photon beam 10x10 cm² field (Elekta Precise) with and without mouthpiece were used for measurements. Backscatter was measured with and without the mouthpiece at a source-to-detector distance of 100 cm in a single field. To assess dosimetric effects of amalgam in the presence of the mouthpiece, a parallel-opposed field beam setup was used.

Results: Standard amalgam causes dose increases of 24-29% at the tissue interface; however, backscatter decreases rapidly to 7-8% at 0.8mm depth. MOSFET and TLD measurements show the mouthpiece reduced backscatter dose by 15% (at 0.4 mm) for single beam and 6-8% for parallel-opposed beams.

The transponders (1.8mm x 8.5mm) in the mouthpiece do not generate measurable additional backscatter.

Conclusion: A mouthpiece when used for continuous target localization and tracking, can effectively reduce backscatter dose caused by amalgams, potentially decreasing mucositis. Embedded transponders do not generate measurable backscatter dose.

Conflict of Interest (only if applicable):

Mate and Zeller have a financial interest in Calypso Medical