

AbstractID: 3521 Title: Feasibility of Tracking Wireless AC Electromagnetic Transponders in Head and Neck Cancer Environment

Purpose:

Precision setup is essential for head and neck IMRT due to the steep dose gradients used. A new device called the Calypso® 4D Localization System (Seattle, WA) has been developed which is capable of performing objective, real-time target tracking during radiation. This system is based on non-ionizing AC electromagnetics that utilizes small wireless Beacon® transponders, and could potentially be used to localize transponders embedded in a mouthpiece as a method to track skull movement during head and neck irradiation. Because AC electromagnetics can be influenced by nearby conductive metals, the effect of dental restorations, such as amalgam, on transponder localization accuracy was studied.

Method and Materials:

A dental prosthesis was casted from a volunteer. 16 of 28 prosthetic teeth were filled with standard dental amalgam. Three transponders set in a fixture were placed under the detection array and baseline measurements of each transponder's x, y and z coordinates away from the array were obtained. Next the prosthesis was placed immediately posterior to the transponders, simulating a worst-case scenario of nearby amalgam. Each transponder's coordinates from the array were re-measured. The transponders coordinates in the presence of the prosthesis were compared to the baseline measurement without the prosthesis. The experiment was repeated with transponders up to 20 cm away from the detection array.

Results:

Results showed that the presence of amalgams had no measurable effect on the system's capability to localize multiple transponders at distances up to 20 cm from the array.

Conclusion:

This investigation demonstrates the potential of wireless AC electromagnetic technology embedded in a mouthpiece to enable accurate and continuous tracking of the skull during head and neck IMRT.

Conflict of Interest:

Work supported by Calypso Medical Technologies.
Authors Mate, Zeller, Eidens and Vertatschitsch have a financial interest in Calypso Medical.