

AbstractID: 2796 Title: A method for repositioning of stereotactic brain patients with the aid of real-time CT image guidance

Purpose: Fractionated stereotactic radiotherapy to the brain is usually delivered using relocatable head frames. Previous studies suggest that with the GTC relocatable frame the position of the patient can be reproduced with uncertainties on the order of 1 to 2 mm. However, the reproducibility of the frame varies from patient to patient and can be poor especially in edentulous patients. The goal of this study was to develop and evaluate a method that recalculates the coordinates of the isocenter for patients undergoing stereotactic treatment to the brain with the GTC relocatable head frame, based on a pre-treatment CT scan.

Method and Materials: The pre-treatment CT scans were acquired with the Primatom CT-on-rails system (Siemens) and they were fused with the planning scan using the XKnife treatment planning system (Radionics). Then the BRW coordinates of the beam isocenter were recalculated using 3D CT-to-CT image registration provided by the planning system, and a 3D CT-to-BRW coordinate transformation.

The method was evaluated by comparing the initial BRW coordinates of the isocenter with the recalculated coordinates for eight single-fraction patients (64 points). These patients had the BRW frame fixed to the outer table of the skull, and therefore the coordinates compared between the simulation and the pre-treatment scan should be identical. Any difference between the two sets of coordinates was attributed to errors in the method.

Results: The results showed that the systematic errors in the recalculated coordinates for the BRW frame were lower than 0.05 mm in all three directions, and they were not statistically significant. The random errors (one standard deviation) were from 0.35 mm (lateral) to 0.58 mm (vertical). The average value of the combined 3D difference was 0.75 mm.

Conclusion: These results suggest that the proposed technique could be used to reduce spatial uncertainties associated with the GTC head frame.