

AbstractID: 11627 Title: On the development of intra-fraction whole body motion tracking during total body irradiation

Purpose: The feasibility of total marrow irradiation (TMI) using highly conformal image-guided Tomotherapy is recently being explored as a radiation dose escalation pre-conditioning TMI regimen for high risk hematological malignancies. Though, initial trial shows potential of this technology, treatment procedure is at present an open loop. This is a concern for safety as well as accuracy of the treatment delivery. The primary objective of this study is to develop a real time optical tracking system (OTS) which will offer better understanding of intra-fraction whole body motion and develop a closed loop feedback approach to treatment that will enhance the safety of this new treatment. **Method and Materials:** A stereoscopic camera system is utilized to track near-infrared reflective markers placed on the Rando phantom. The cameras were calibrated to determine the 3D location of each detected marker. The entire stereoscopic marker detection system returns a set of 3D marker locations at a rate of 60 Hz. Five criteria for evaluating motion capture technology are considered for selection of the optical detection system – accuracy, bandwidth, frame rate, capture volume, and real time performance. The translational motion detection uncertainties in OTS are measured and compared with onboard three dimensional megavoltage CT (MVCT) scanning system for pre-treatment setup verification. **Results:** The preliminary work has shown : (i) the translational motion with better than 4mm accuracy, (ii) the vision-based acquisition can be performed very quickly (in second) compared to the MVCT scan (5-10 minutes) method currently used for initial patient positioning; (iii) bony portions of the body can be accurately tracked in three dimensions. **Conclusion:** The proposed method entices the effectiveness of vision-based whole body patient motion tracking for use with the helical tomotherapy treatment.