AbstractID: 3593 Title: Target Localization of Intensity Modulated Radio-Surgery Patients Using ExacTrac System

Purpose: The Novalis body system, ExacTrac®, was used to verify target localization and to improve patient positioning for daily treatment with patient pre-positioning by mask and head frame in intensity modulated radio-surgery(IMRS). This study is to present preliminary results of quantitative measurements from the ExacTrac system.

Method and Materials: Accuracy of image fusion and correct calibration of ExacTrac system were investigated using the head section of anthropomorphic phantom. The phantom was randomly moved away from the target position manually and re-positioned using the ExacTrac system. Couch final position was then compared with target position to determine positioning errors. ExacTrac recorded data from 12 patients was used for this study. A verification plan for exporting DRRs to ExacTrac was created for each patient using reference point as localizer. The patient was placed on the couch with mask and isocenter was aligned with target positioner. Two x-ray images were taken and registered to DRRs using automatic 3D fusion. After visual examination of the match of bony structures surrounding the isocenter, the necessary couch movements were performed based on shifts computed from 3D fusion.

Results: For 7 cranial patients with total 106 treatments, the lateral, longitudinal and vertical average shifts were 0.80, 1.91, and 0.99 mm respectively; for 4 orbital patients with total 103 treatments, the shifts were 0.6, 1.4, and 0.6mm respectively; for one C-spine patient with total 28 treatments, shifts were 1.5, 1.6, and 2.3 mm respectively. According to 11 phantom measurements, our ExacTrac system had accuracy of 0.27, 0.64, and 0.55 mm respectively.

Conclusion: Target shifts in patient positioning by mask and head frame could be more than 1.0 mm and was larger in longitudinal direction for treatment of cranial and orbital tumors. With x-ray image guidance, ExacTrac system localizes target with accuracy of less than 1.0 mm.