

AbstractID: 3033 Title: An Image Guided Target Localization System for Brain Radiosurgery and Fractionated Stereotactic Radiotherapy Using a Non-Invasive Fixation

**Purpose:** To develop an image guided target localization technique to improve the patient positioning accuracy for brain radiosurgery and fractionated stereotactic radiotherapy using non-invasive fixation.

**Materials and method:** BrainLab stereotactic localization box system is used for the initial patient setup. The patient is immobilized using a thermal mask with a mouth bite piece. An image guided localization system (Novalis body system, BrainLab) is used to finely adjust the position after the initial setup. The system automatically fuses two X-ray images with the corresponding DRR and gives the position offsets in 6 dimensions. The accuracy of the image guided localization system was evaluated in a RANDO phantom with a 2-mm-metal-ball placed as the isocenter, and in 15 patients with total of 48 fractions for image fusion.

**Results:** The phantom study showed that the positioning accuracy is within 1-mm for various isocenter positions. The image fusion for each patient was checked carefully and could be evaluated easily due to its rigid structure and rich bony features. At least three distinguish features could be identified in each image, and a 1-mm translational move generally induced a visible dis-matching in these features. This suggests that the accuracy of alignment to the isocenter of the X-ray system be better than 1-mm. Considering that the isocenter of the X-ray system could be different from the linac's, the overall positioning accuracy for the image guided system would be in the order of 1.4-mm. The offsets of the fusion results was used for mutual testing between the image guided system and the stereotactic localization box system. The average offsets for the lateral, AP and longitudinal directions were  $-0.67 \pm 1.09$ ,  $0.44 \pm 1.09$ , and  $-0.84 \pm 1.44$  mm, respectively. This is consistent with the results of the non-invasive immobilization techniques reported by other authors.

**Conclusion:** The image guided system could improve the patient positioning accuracy.