AbstractID: 3600 Title: Target Refixation Through Automatic Mapping Of Real-Time Surface Images With The Planning-Used Images

Purpose: to develop an accurate and precise surface-guided target refixation through optimally mapping real-time surface images with planning volume images.

Method and Materials: An algorithm of merging the real-time surface images captured by a video camera and the simulation-planning volume images obtained through a CT or MR scanner is presented. The first concern is the systematic difference between CT/MRI skin contours and optic surface. The surface image artifacts are removed at the surface reconstruction by setting a limit on jumps at the neighboring facets. The partial-volume effect and table-patient movement in CT/MR images are corrected through comparison of the skin contours with an instant surface image without motion and partial-volume effect. The second concern is that the skin surface is not rigid and it changes with the facial expression such as opening and closing of the mouth. To capture the consistent surface images, we have added a function of continuous monitoring of facial movement. A template-based image registration and automatic surface alignment using a modified ICP algorithm have characterized the surface shape and landmarks' information and organize them into a reliable representation of the patient head position, which has lead to improve efficiency and robustness in surface-guided target localization and radiation dose delivery.

Results: Accuracy and precision of < 1 mm and efficacy of < 1 minute have been obtained in phantom experiments and on patients in a clinical trial.

Conclusion: By using this refixation system, one can directly transform the surface images into the planned treatment position, quickly visualize the anatomical information relative to the treatment machine, and accurately detect the target positioning error in all six degrees of freedom.

Conflict of Interest (only if applicable): Authors are either consultant or employees of the camera company.