AbstractID: 8432 Title: Evaluation a clinically practical offline IGART procedure

Purpose: In off-line IGART sessions, onboard cone-beam CT (CBCT) allows one to acquire volumetric information of a patient prior to treatment on a routine basis. This makes it possible to adaptively modify the patient treatment plan with consideration of organ deformation as well as previously delivered doses. The aim of this work is to evaluate a clinically practical offline adaptive therapy procedure and quantify the potential geometry impact of the deformable registration image on adaptive head-and-neck IMRT treatment. In this paper, we evaluate the accuracy of image registration and segmentation on H&N CBCT images.

Method and Materials: We have implemented an intensity-based image registration method, and the resulting displacement fields are used to warp the planning ROI to the daily CBCT images. A total of 9 daily CBCT images with specific setup errors (0~5mm) were acquired by using a rigid H&N phantom following our clinical IGART protocol. The accuracy of the image registration and segmentation is then evaluated by comparing position of each daily image voxel calculated from the image registration and the rigid-body transformation. The evaluation was performed for each ROI using the following quantities: (1) the difference in ROI volumes; (2) ROI center shift and (3) all pixel displacement within ROI.

Results: Automatic deformable registration showed good accuracy. For all ROIs, the mean volume difference is -1.5±2.3cc. The difference between ROIs center shift is 0.4±0.2mm, 0.2±0.6mm, 1.2±0.6mm, and 1.4±0.6mm respectively in RL, PA, SI direction and magnitude. When compared all image pixel within ROIs, the difference is 0.5±0.2mm, 0.3±0.5mm, 1.1±0.5mm and 1.6±0.5mm in RL, PA, SI direction and magnitude respectively.

Conclusion: With intensity-based image registration it is feasible to automatically delineate ROIs on the H&N CBCT images in adaptive radiotherapy.

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