AbstractID: 8701 Title: Automatic contour delineation on cone beam CT (CBCT) and verification

Purpose: Patient anatomy manifested on cone beam CT (CBCT) image is useful for treatment localization, however, automatic organ segmentation on CBCT is challenging and its accuracy needs to be established. The purpose of this study is to quantify the accuracy of automatic contour delineation on CBCT using weekly helical CT (HCT) and daily CBCT images.

Method and Materials: Images from 5 head and neck IMRT patients were used in this study. Each patient had 5 to 6 weekly HCTs and daily CBCTs. Those images are registered to planning HCT using a freeform deformable image registration algorithm. Contours were automatically generated for both HCTs and CBCTs using planning contours and registered displacement. The resulting contours on weekly HCT were used as reference, and compared to contours on CBCT with respect to ROI volume, ROI center coordinate, and ROI surface discrepancy. The ROI surface discrepancy was determined using distance transform of ROI masks.

Results: GTV, left parotid, right parotid and mandible, are selected for comparison. GTV volume discrepancy in percentage is -2.8±6.1%, ranging from -9.8% to 11.5 %. GTV volume discrepancy in magnitude is -2.3±3.6cc, ranging from -7.8 to 3.8cc. Volume discrepancies for left parotid, right parotid, and mandible are -6.7±4.7%, -3.6±4.1%, -4.3±5.0% in percentage respectively, and -1.3±1.1cc, -3.2±3.6cc, -0.8±1.0cc in magnitude. The mean difference in ROI centers for all organs is less than 2mm with a maximum of 4mm. Surface discrepancy of GTV, left parotid, right parotid, and mandible are -0.33±1.8mm, -0.28±1.1mm, -0.32±0.9mm, and -0.28±0.9mm respectively.

Conclusion: Most of contours from CBCT has slightly smaller volume but all show excellent match to those from HCT , with most surface discrepancy within image voxel size. Further investigations on quantifying dosimetric effect of the geometry uncertainty are underway.

Conflict of Interest (only if applicable): Support in part by NCI Grant - CA091020