Purpose:

Anatomy delineation is a major time consuming task to correct for inter-fractional changes in anatomy. Atlas-based auto-segmentation (ABAS) was developed to expedite this process. This study aims to evaluate the performance of ABAS applying to high quality verification CT-imaging acquired using a CT-on-rail system for prostate cancer.

Methods:

The prostate, rectum and bladder were manually contoured for seven prostate cancer patients. For each patient, three patient specific atlases were generated consisting of one, four and seven prior image and contour sets. ABAS was applied using these atlases for the last seven daily CT images of each patient. The auto- and manual-contours were compared both geometrically and dosimetrically. The reproducibility of the observation was validated by an experienced radiation oncologist performing the same procedure. The performance of ABAS with patient and non-patient specific atlases were also evaluated on 21 image sets. P<0.05 was considered statistical significant for two-tailed paired student t-test.

Results:

Contours obtained from ABAS agreed well with the manual ones. With 1-image set atlas, the OI and DSC for the bladder were greater than 96% and 91%, respectively. Both indices were above 81% for rectum and prostate. The consistencies significantly improved by including 4 image sets in the atlas, while a further increase of atlas size to 7 did not show obvious benefits. Dose coverage for the auto- and manual-contours was similar for all organs. Similar results were obtained by the second observer. Compared with non-patient specific atlas, patient specific atlas yielded more accurate contours. The time for ABAS and manual contouring was ~2 min and ~20 min per image set, respectively.

Conclusions:

With diagnostic quality verification images, ABAS can provide fast and accurate delineations for prostate cancer on a daily basis. The inclusion of more than one CT set in atlas improves the contouring results.

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No conflict of interest.