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THE DOSIMETRIC IMPACTS OF CT-BASED AUTOCONTOURING ALGORITHM FOR BREAST CANCER RADIOTHERAPY PLANNING

PURPOSE:
In many institutions, tumors, and organs at risk contours are delineated manually; this is also costly and time-consuming. Recently, various automatic contouring methods have been developed to address these problems. However, these methods may not provide accurate contours for the physicians. One of the reasons is that most autocontouring algorithm results have been produced on CT images and are not optimal for the task of automated contouring.
Recently, artificial intelligence-based models have emerged that provide high accuracy in many anatomical regions in a shorter time. In study, it was aimed to dosimetrically evaluate the usability of a new generation autocontouring algorithm (DirectORGANS) that automatically identifies organs and contours them directly in the computed tomography (CT) simulator before creating breast radiotherapy plans.
METHODS:
The CT images of 30 patients were used in this study. All of the patients who underwent BCS (breast conserving surgery) were given radiotherapy. The breast as a target volume of 30 patients were automatically contoured based on DirectORGANS algorithm at the CT simulator. The CT scans were imported into the Eclipse treatment planning system for contouring. On the same CT image sets, the same breast volumes and contours of organs at risk were manually contoured RTOG-atlas based by an experienced physician and used as a reference structure. For each patient, volumetric arc therapy plans were generated using the reference contours (RefPlan). The dose scheme of 40 Gy/15 fractions were administered to the clinical target volume. The doses of manually delineated contours of the target volume and the doses of auto contours of the target volume were obtained from the dose volume histogram of the same plan.
To evaluate the target volumes, conformity index (CI) and homogeneity index (HI) were calculated. The Wilcoxon test was employed for statistical comparison with statistical package SPSS ($P<0.05$).
RESULTS:
Compared to the doses of the manual contours (MC) with auto contours (AC), there were statistically significant differences between HI and CI and clinical target volume covered by the 95% isodose line values due to differences in breast contouring ($p < 0.001$).
CONCLUSION:
To evaluate the dosimetric impact of using potentially inaccurate auto contours directly for treatment planning, the breast doses were evaluated from planned RefPlan. The current results indicate that automatically contoured breast target volume based on DirectORGANS algorithm is not reasonably concordant with clinician manual contouring based on RTOG Atlas. The differences between clinician contours and auto contours may be due to the DirectORGANS algorithm contour a larger breast volume than RTOG-atlas guidelines adhered to by clinicians. Consequentially, this volumetric discordance can cause meaningful dosimetric differences. Whilst DirectORGANS algorithm could be utilized as a starting point, contours will require modification by clinicians to conform to the RTOG atlas.

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