AbstractID: 13350 Title: Methods for improvement of clip localization in CBTS for breast cancer patients setup verification.

Purpose: To establish clip localization procedures for setup verification of breast cancer patients based on Cone-Beam Tomosynthesis (CBTS). To develop an automatic clips registration algorithm and characterize its accuracy and efficiency versus the manual procedure. Furthermore, to determine potential benefits of 80°CBTS over 40°CBTS. **Method and Materials:** CBTS and CBCT images were reconstructed for 7 breast cancer patients with surgical clips implanted around the tumor cavity. Known shifts of patient anatomy were introduced and registration of clips was carried between the reference and treatment reconstructions using two methods: manual and automatic. Manual method relied on matching of clips in CBTS with clip contours drawn in the reference CT. An automatic clip localization method consisted of two image processing steps: auto-segmentation using multi-level thresholding and prior knowledge about clip size and locations followed by auto-registration of the segmented clips. **Results:** The automatic method was developed and demonstrated to accurately localize clips with Hounsfield Units > 460 with an accuracy of better than 2.5mm. Accuracy of manual method registration was slightly better (accuracy <1.5 mm). However, time efficiency of manual method was up to a few minutes depending on the spatial distribution of the clips, their HU, CBTS-specific artifacts and experience level of the users. Performance of the automatic method is user independent and fast. **Conclusion:** Surgical clips can be accurately localized in CBTS images used for breast cancer patient setup using both methods. The manual clip localization is user dependent and generally inefficient. In order to improve the efficiency of the setup procedure, automatic clip registration is recommended. The automatic algorithm based on multi-level thresholding is straightforward to implement on linac-mounted CBCT systems with estimated time of clip localization of up to a few seconds.
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