

Localization accuracy of target verification system using digital tomosynthesis (DTS)

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PURPOSES: A research platform was developed for target verification using digital tomosynthesis (DTS). To verify its accuracy, a phantom study was conducted and several clinical cases were investigated.

MATERIALS AND METHODS: customer-developed reconstruction and image registration algorithms were implemented in this platform. The existing image reviewing software was employed for the purpose of manual registration. Phantom study was conducted to investigate the target localization accuracy using DTS with respect to different simulated shifts along three directions. In real clinical cases, the registration results of both CBCT-based and DTS-based methods were achieved and compared for identify their equivalency.

RESULTS: with respect to different simulated shifts of phantom ranging from 1 cm to 5 cm, the high target localization accuracy was obtained which is within 1 mm. The comparison between CBCT-based and DTS-based registration results on clinical cases shows that they are nearly identical. The maximal different is less than 0.5 mm and averagely 0.1 mm over three dimensions was observed.

CONCLUSIONS: DTS is an effective way for fast target localization. With properly setting, the high registration accuracy comparable to CBCT can be achieved. Currently, more effects related to acquisition mode, scan angles, and reconstruction slice thickness, were under investigation. It is expected to present interested user a clear guidance on how to use this new image modality more effectively for image-guided radiotherapy.

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