

Purpose:

The goal of the Deep Inspiration Breath Hold (DIBH) technique is to avoid direct radiation to the heart while treating the left breast tissue. Accurate and reproducible treatment setup of the patient is very important to successfully achieve the benefits of the DIBH technique. The purpose of this work is to introduce a device named the Real Time Skin Surface Distance (RTSSD) that accurately tracks the patient position during therapy.

Methods:

Five left-sided breast cancer patients were used for this study. The RTSSD device consists of a laser distance meter rigidly fixed to the treatment couch. At the time of simulation, the RTSSD device measures chest position at the sternum tattooed location during free-breathing and DIBH CT scans. Prior to each radiation treatment, free breathing and DIBH distances are measured at the sternum tattoo location using the RTSSD device and compared to the ones measured at the time of the CT scans. If a difference larger than ± 3 mm is found, the patient is repositioned. KV orthogonal images are acquired during DIBH and compared to the reference digital radiographs for internal verification. During irradiation, the therapist monitors the RTSSD measurement and interrupts the treatment if it exceeds the 3 mm tolerance. Cine EPID images, acquired during irradiation, are used retrospectively to validate the localization.

Results:

The RTSSD device tracked the patient accurately during the DIBH treatment as confirmed by in-treatment imaging. The cine EPID images showed agreement with reference DRRs within the ± 3 mm tolerance.

Conclusions:

The RTSSD device is non-invasive, easy to operate and well tolerated by the patients. The device tracked accurately the distance from patient's sternum tattooed location during DIBH simulation and delivery. Imaging results confirmed that the device measurements were reliable to use for patient positioning during DIBH treatment.