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475 EVALUATION OF REPOSITIONING ACCURACY OF PATIENTS WITH BREAST CANCER USING A 3D VIDEO IMAGING SYSTEM

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A 3D video imaging system is used to evaluate the inter-fractional positioning accuracy of breast cancer patients.

A stereo-imaging system (AlignRT, VisionRT Ltd., London, UK) is used to reconstruct 3D patient surfaces with high resolution by projecting a speckle pattern to the patient's skin. The registration of the actual surface with a previously recorded reference surface provides 4 or 6 degrees of freedom couch transformations that minimize the distance between both surfaces in a user-defined region of interest. The imaging system allows real-time monitoring and gated capture at a specified breathing phase. The realignment accuracy of the system was investigated by performing 70 well-defined shifts and rotations to a phantom and by measuring these shifts and rotations with the system. A study with 10 patients and a total of 135 fractions was performed to quantify the variation of the daily setup error after conventional positioning using room lasers and light fields. For this, the image of the actual treatment position was registered with the image of the position at the first fraction. Both images were acquired by gated capture at the end expirative breathing phase.

By comparing the measured with the pre-defined phantom shifts, the radial deviation (δx, δy , δz: shift differences in x,y,z respectively) was found to be 0.39 mm ± 0.31 mm (max. 1.02 mm). The average rotational error was less than 0.1° (max. 0.26°). From patient to patient, the standard deviations of the radial deviation varied between 1.34 mm and 2.55 mm. The standard deviations of the rotational setup variations ranged from 0.86° to 2.08°.

The surface imaging system AlignRT reliably detects patient setup errors with submillimeter accuracy and provides couch transformations for setup correction. The system can be used to improve reproducibility of patient setup in fractionated radiotherapy. Using a reference image acquired with a second video imaging system at the treatment planning CT, the setup uncertainty at the first fraction may also be reduced.