Quality Control Tests of a Commercial Ultrasound Localization System for Image-Guided Radiation Therapy

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A quality control study was performed for a mobile system for ultrasound soft tissue localization for radiation therapy (BAT™) with a prototype QA ultrasound phantom. BAT combines an ultrasound imaging system with a digitizing arm for tracking the location of the image planes. The purpose of this test was to determine the consistency of the BAT system in repositioning a test object.

Tests were done in a simulated treatment room containing a therapy couch and wall mounted lasers for alignment. Measurements were taken from scales on the phantom, and from a table positioning device (CRANE™), accurate to ± 0.10 mm. Starting from isocenter, the phantom was moved a random distance in x, y, and z directions. BAT was then used to image and align the phantom based upon contours of the phantom contrast objects from a treatment planning system. Tests were repeated using lower resolution contours in order to determine the effect of contour resolution on alignment accuracy.

The mean vector distance between measured and BAT offsets was 1.341 mm and the standard deviation was 0.686 mm. The difference between the mean measured and BAT-determined isocenter position was (x,y,z)= (0.181, 0.098, 0.030) mm. There was little variation of alignment accuracy with contour resolution. This may be due to the regular geometry of the phantom contrast objects.

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