Purpose or Objective: The purpose of this study was to evaluate the clinical accuracy of the Synchrony Respiratory Tracking System (SRTS) of the CyberKnife (CK).

Material and Methods: We analyzed 65 patients with lung lesion who had been treated with the SRTS from August 2012 to August 2015. Respiratory motion data were obtained from cine magnetic resonance (MR) images. MR scans were performed with a 1.5-Tesla whole-body clinical MR scanner, and the cine MR images of sagittal plane were obtained. We collected respiratory motion data of each patient from the cine MR images using in-house software. The dynamic motion phantom (DMP) was used to reproduce the motion of both the tumor and the surface of the patient’s abdomen. We used a 20 mm diameter plastic ball as the target. A gold marker was placed at the center of the ball. Treatment plans were created based on static CT scans and standard CK treatment parameters. Each plan utilized ten beams with several different source positions. All of the beams in each plan were aimed at the center of the ball target, and were set to 200 MU for 15 seconds of data acquisition. The CK was subsequently operated with the SRTS, with a CCD camera mounted on the head of the linac. The central axis of the CCD camera was matched to the central axis of the linac beam using a custom-built jig. The recording by CCD camera was performed during the tracking of the ball target by the linac. The tracking error was defined as the distance from the center of the images to the center of the ball in the images recorded by CCD camera. The tracking error was measured at 30 Hz using in-house software. The probability in excess of 95% (Ep95) for each direction was estimated. The SRTS accuracy was defined as the median value of Ep5 for ten beams (Ep95med).

Results: The mean value and standard deviation of Ep95med was 2.5 ± 0.9mm. The Spearman’s correlation coefficient determined by the rank test indicated that the range of motion of the tumor was significantly related to Ep95med (P < 0.01).

Conclusion: The accuracy of SRTS was considered to be clinically acceptable. However, suitable margin to the clinical target according to the range of motion of the tumor seems to be necessary for the safe treatment to each patient.

EP-1745
Radiotherapy in breast cancer with voluntary deep-inspiration breath-hold using BrainLab Exactrac E. Ippolito1, R. D’Angelillo1, A. Sicilia1, S. Silipigni1, B. Fiorenò1, E. Molfese2, A. Di Donato1, P. Trecca1, D. Gaudino1, G. Stimato1, S. Ramella1, L. Trodella1
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Purpose or Objective: Adjuvant radiotherapy in left-sided breast cancer with voluntary deep-inspiration breath-hold technique (vDBIH) may reduce the irradiation dose to the heart. The aim of this study is to estimate the heart, lung and PTV dosimetric constraints and the reproducibility of vDBIH radiotherapy using BrainLab Exactrac monitoring system.

Material and Methods: 10 women with left breast cancer who had undergone breast-conserving surgery and who required adjuvant radiotherapy to the whole breast, were enrolled and were shortly trained before simulation CT-scan to hold their breath. The first scan was acquired in free-breathing (FB_CT) and the second one in vDBIH (vDBIH_CT). Target and organ-at-risk (OAR) volumes were delineated in both CT scans and for both of them computerized treatment planning was performed using two tangential fields technique. We compared the dose distribution for the heart, left anterior descending coronary artery (LAD), ipsilateral lung and planning target volume (PTV) using standard defined parameters: mean dose and maximal dose applied to the LAD; percentage of the heart volume receiving at least 5 Gy (V5Gy) and 10 Gy (V10Gy); percentage of the ipsilateral lung volume receiving at least 20 Gy (V20Gy); and the volume of the PTV receiving 95% of the prescribed dose (V95%).

Results: A significant reduction in heart V5 and LAD Dmax (2.71 vs 0.99 Gy p=0.02 and 16.56 vs 6.90 Gy p=0.012 respectively) parameters was recorded for vDBIH_CT treatment plans (see Table 1 for complete results). There were no significant differences between vDBIH and FB treatments in lung dosimetric parameters and target volume coverage. 1694 portal images were evaluated. During treatment, the mean displacements observed in the longitudinal, vertical and lateral direction were 0.132 mm (SD=0.011), 0.013 mm (SD=0.137), 0.116 mm (SD=0.010).

Conclusion: vDBIH technique reduces cardiac irradiation compared with conventional free-breathing treatment plans, without jeopardizing the proper coverage of the target. vDBIH for left-side whole breast irradiation can be accurately implemented using BrainLab Exactrac system with high and accurate reproducibility (mean shift <0.15 mm).

EP-1746
Stereo/monoscopic motion tracking of the prostate using room-mounted x-ray image guidance T. Stevens1, D. Parsons1, J. Robar1
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Purpose or Objective: Intrafraction internal motion of the prostate currently limits the accuracy of external beam radiotherapy, requiring expanded ITV boundaries and introducing geometric uncertainty. Techniques to monitor prostate motion at the millimeter scale are thus needed. Room-mounted dual x-ray systems can provide stereoscopic localization of the prostate via implanted fiducial markers, however the treatment head frequently blocks one of the x-ray tubes as the gantry rotates. We implemented a monoscopic 3D localization algorithm, allowing localization even when one of the x-ray tubes is obstructed. We show that this technique allows accurate localization throughout the treatment fraction, improving the tracking capabilities of room-mounted x-ray systems.

Material and Methods: A gold fiducial marker was placed in the prostate of an anthropomorphic phantom, and initially aligned to isocentre. The linac couch was used as a translation stage, and programmed with a realistic prostate motion trajectory. Continuous dual x-ray images (140 kVp,