research purposes, but not used for clinical decision making. Doses to the PTV, lung, heart and LAD were recorded. Four patient groups were identified for comparison: those who had at least one heart parameter worse with DIBH, minimal benefit arbitrarily defined as less than 20%, moderate benefit defined as between 20%-70% and a major benefit defined as greater than 70%.

Results: Data was collected for a total of 70 patients. Overall, using DIBH, lung volume increased on average by 68% (range: 18.5% - 124.3%) while the heart volume in the treatment field was reduced by an average 69.5%. The LAD volume within the treatment field was reduced by 53%. The degree of benefit for heart and LAD doses is outlined in table 1. 10% had at least one heart parameter worse with DIBH. Where the mean heart dose was higher all other heart constraints were worse. Five patients had an increase in the heart volume and maximum heart distance in the treatment field.

Conclusion: Patients where DIBH was detrimental to heart dose constraints, no clear correlation could be drawn to identify this cohort of patients. Lung volume or percentage increase did not necessarily lead to more favourable outcomes, thus could not be used as a criteria for patient selection for DIBH. We aim to establish further predictive criteria in the second phase of this study. Until such time dual planning remains essential to identify patients who should not be offered DIBH.

OC-0166
The influence of tumour location in the breast on boost modality selection.
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Purpose or Objective: To establish whether photon or electron beams provide better dose coverage to tumour bed sites in different regions of the breast.

Material and Methods: 10 patient data sets were selected from a trial cohort, 2 patients each with tumour beds in one of 5 regions within the breast. - Superior Lateral Quadrant (SLQ), Superior Medial Quadrant (SMQ), Inferior Lateral Quadrant (ILQ), Inferior Medial Quadrant (IMQ) and the Central Quadrant. The dose to the whole breast treatment of 50Gy in 25 fractions was combined with a boost plan to the tumour bed of either photons or electrons with a dose of 16Gy in 8 fractions. Dose to the PTV, lung, heart and breast tissues outside the tumour bed were assessed by using DVHs.

Results: Tumours in the SLQ received better dose coverage by the photon boost plans. In all other areas of the breast the tumour bed coverage objectives were met with either photons or electrons.The target coverage in the combined plans was at least the same as or better than electrons with photon beams in all cases (Figure1). Electron beam coverage is dependent on surface contour regularity and tumour geometric shape, particularly if the PTV is not perpendicular to the skin surface and so requiring higher electron energies for PTV coverage at the deep margin. Lung had consistently lower doses with photon boost plans as the higher electron energies selected for target coverage in some plans increased lung dose (Figure2). The breast outside the tumour bed received lower doses with photon boosts. The heart doses were not consistently lower with either modality.

Conclusion: Electrons were a less favourable modality for SLQ tumours, but either photons or electrons could be suitable for treating tumours in other regions of the breast in terms of target coverage and organ sparing. As photon boosts provided the same as or better coverage than electrons in combined plans, it would be feasible to use photons for all boosts. However, individualised planning is necessary to account for tumour position in relation to normal anatomy, surface contour and geometrical shaping of the tumour bed to optimise PTV coverage and organ sparing. If using electrons particular attention must be paid to the use of bolus for beams planned on irregular surface contours.

OC-0167
Advanced left-side breast cancer: does VMAT allow doses of organs at risk to be reduced?
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Purpose or Objective: This study was to quantify the reduced dose of right lung and right breast tissue by modified volumetric modulated arc therapy (MVMT) for advanced left-side breast cancer including lymph node irradiation.

Material and Methods: For all cases, the clinical target volume (CTV) consisted of the left breast, axillary lymph nodes, internal mammary chain lymph nodes, infraclavicular lymph nodes, and supraclavicular lymph nodes. 7 patients of MVMT and 5 patients of volumetric modulated arc therapy (VMAT) were generated with the Eclipse version11 treatment planning system. VMAT plans were generated using a five full rotation without avoidance sector. MVMT plans were generated using a five partial rotation with avoidance sector.Two half arcs were for supraclavicular lymph nodes. Gantry angle started at 179 degree, stopped at 335 degree, and the 60-120 degree was set to be avoidance sector.
Gantry angle started at 181 degree, stopped at 35 degree, and the 240-300 degree was set to be avoidance sector. Two half arcs were for left-side breast and axillary nodes. Gantry angle started at 153 degree, stopped at 282 degree, and the 0-90 angle was set to be avoidance sector. Gantry angle started at 282 degree, stopped at 161 degree, and the 0-90 angle was set to be avoidance sector. One quarter arc was for internal mammary node. Gantry angle started at 179 degree, stopped at 270 degree, and the 60-120 angle was set to be avoidance sector. The dose-volume-histogram were evaluated the target homogeneity and conformity and normal tissue tolerance dose.

Results: MVMAT has significantly (p-value = 0.031) decreased right-side breast dose (V5Gy (%) = 39.9 ± 7.6), and has significantly (p-value = 0.005) decreased right lung dose (V5Gy (%) = 23.6 ± 7.3). Slightly less heart and left lung dose are found for MVMAT (heart V10Gy (%) = 45.7 ± 17.4, left lung V10Gy (%) = 48.6 ± 3.4) than in VMAT (heart V10Gy(%)=55.7 ± 19.9, left lung V10Gy(%)=53.4 ± 5.1). MVMAT for advanced left-side breast cancer retains target homogeneity and coverage when compared to VMAT.

Conclusion: MVMAT is suitable for advanced left-side breast cancer treatment. It retains target homogeneity and coverage and decreases the dose of right breast and right lung.

Purpose or Objective: Voluntary moderately deep inspiration breath hold (vmDIBH) reduces the heart dose for radiotherapy of left-sided breast cancer patients. For locoregional breast cancer patients, the application of vmDIBH requires high reproducibility to assure the absence of gap or overlay between tangential breast fields and supraclavicular irradiation fields. In this study we present a simple and fast visual method to quantify movement around the junction of the tangential and supraclavicular fields. The simple method is evaluated by testing the target volume reproducibility using two consecutive CT-scans during vmDIBH. Heart position reproducibility is assessed as well, with the resulting dosimetric consequences.

Material and Methods: For 80 consecutive breast cancer patients cranial-caudal (CC) displacement around the clavicle was quantified between five vmDIBHs. This was done in the CT room, before obtaining the planning CT scan. Intersecting CT laser lines were marked on tape and the maximum displacement was measured. This tape was positioned midclavicularly, with the horizontal laser lines on the junction line. For 19 patients who would be irradiated locoregionally, a second CT scan was additionally acquired. The CC displacement of the left clavicle between the two breath holds was quantified by contouring the clavicle in both CT scans, and rigid registration of the two volumes in ProSoma (v.3.3.266, Medcom, Darmstadt, Germany) virtual simulation software. The heart was delineated in both CT scans, excluding the great vessels. The two volumes were registered in ProSoma to measure CC, left-right (LR) and anterior-posterior (AP) displacements. Influence of the heart displacement on dosimetry was measured by superimposing the contoured heart volume of the second CT scan onto the treatment planning CT scan and calculating mean heart dose.

Results: Results of the tape test show a mean CC displacement of 3.3 mm (range 0.5-8.0 mm) for the midclavicular region. For the two breath hold CT scans mean CC clavicle displacement was 1.1 mm (range 0.1 - 2.8 mm). The measured CC displacements of the tape test were for all 19 locoregional patients larger than measured with CT. Mean difference in contoured heart volume was 3.7% (range 0.5 - 11.2%). Mean heart dose differed on average 0.12 Gy (range 0.01 - 0.38 Gy), where planned mean heart dose varied between 0.59 and 3.58 Gy. Mean heart displacement was 1.7 mm (range 0.4-7.7 mm) CC, 1.5 mm (range 0.1-4.2 mm) AP and 1.9 mm (range 0.1-6.9 mm) LR.

Conclusion: A simple visual test is a good surrogate for CT scans in analyzing vmDIBH reproducibility. We showed that vmDIBH is reproducible with minimal gap or overlay between