patients with clinical edema and grade 2 induration, mean difference in dermis thickness was 1.61 mm (0.27 - 2.95, p<0.03). Edema was associated with a more diffuse signal and an indistinct demarcation against the subcutaneous tissue. This was more pronounced in the lower quadrants (Figure).

Conclusion: High-frequency US has potential to measure increased dermis thickness associated with radiation-induced induration in breast cancer patients. Edema may increase dermis thickness and lead to a more diffuse US signal.

High-resolution ultrasound images of two patients without- and with edema. Both have grade 2 fibrosis.

EP-1156
Radiotherapy for ductal carcinoma in situ: patterns of recurrence and risk factors stratification
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Purpose or Objective: Ductal carcinoma in situ (DCIS) represents around 20% of breast cancers (BC). Standard treatment after breast conserving surgery is still adjuvant radiotherapy (RT). Several randomized trials and meta-analysis showed a 50% risk reduction in LR after adjuvant RT. The aim of our analysis was to evaluate the LR rate and possibly to identify a risk groups stratification for DCIS treatment optimization.

Material and Methods: We analyzed 457 patients that underwent BCS and adjuvant RT between 1990 and 2012. Median dose to the whole breast was 50 Gy in 25 fractions; patients with positive/close final surgical margins received a tumor bed boost. We stratified patients in low risk group using well known risk factor for LR: age 80 years, surgical margins <10 mm, nuclear grade 1-2, pT<1 cm), and intermediate-high risk group (age >50 years, surgical margins <10 mm, nuclear grade 3 or pT>1 cm). We performed also a patient stratification according to Van Nuys Prognostic Index. Estrogen and progesterone receptors status, nuclear grade, and Ki-67 proliferative index were available for most patients.

Results: The mean age was 57 years (range 33-80). Hormonal status was positive in 92% of patients. 83 cases (18.2%) received adjuvant endocrine therapy. All patients received postoperative RT, 198 cases (43%) received also a RT boost on tumor bed.

At a median follow up time of 12 years (range 3-23), we observed 26 LR (5.6%). Following risk groups stratification, we observed seven LR (3.4%) in low risk group and nineteen LR (7.4%) in intermediate-high risk group (p<0.001).

Conclusion: Our experience evidenced a significant difference in LR incidence after adjuvant RT based on our risk factors stratification. This confirms the wide heterogeneity of DCIS. Identification of clear subgroups of patients following risk factors is still lacking. Waiting for results from ongoing clinical phase 3 trials and genomic studies, postoperative RT still remains a mainstay in adjuvant treatment for DCIS.

EP-1157
Abstract withdrawn

EP-1158
Should breathing adapted radiation therapy also be applied for right-sided breast irradiation?
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Purpose or Objective: Voluntary moderate deep inspiration breath-hold (vmDIBH) is widely used for patients with left sided breast cancer. The purpose of this study was to investigate the utility of vmDIBH in local and locoregional radiation therapy (RT) for patients with right-sided breast cancer.

Material and Methods: For fourteen patients with right-sided breast cancer, forward IMRT plans were calculated on free-breathing (FB) and vmDIBH CT-scans, for local- as well as locoregional breast treatment, with and without internal mammary lymph nodes (IMN). We compared dose volume parameters to estimate the reduction in the risk of radiation pneumonitis, the influence on pulmonary lung function tests and the risk of secondary lung cancer with the use of vmDIBH.

Results: For local breast treatment, no relevant reduction in mean lung dose (MLD) was found. For locoregional breast treatment without IMN, the average MLD reduced from 6.5 to 5.4 GY (p<0.005) for the total lung and from 11.2 to 9.7 GY (p<0.005) for the ipsilateral lung. For locoregional breast treatment with IMN, the average MLD reduced from 10.8 to 9.1 GY (p<0.005) for the total lung and from 18.7 to 16.2 GY (p<0.005) for the ipsilateral lung. We also found a reduction in mean heart dose between 0.6 and 2.6 Gy in four patients; with a mean of 0.4 Gy for all 14 patients together (p<0.07).

We estimate that 1 out of 100 patients will not develop radiation pneumonitis when breath-hold is applied during locoregional right-sided breast cancer treatment. For ever-smoking women, the risk of secondary lung cancer might also be reduced by vmDIBH.

Conclusion: Breathing adapted radiation therapy in patients with left-sided breast cancer is becoming widely introduced. As a result of the slight reduction in lung dose found for
Does a SPECT-CT improve the delineation of internal mammary nodes for breast cancer patients?

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**Purpose or Objective:** A large recent study (1) has shown that in patients with early-stage breast cancer, irradiation of the regional (internal mammary and medial supraclavicular) nodes improves disease-free and distant disease-free survival, while breast-cancer mortality is reduced. However, internal mammary nodes (IMN) are usually delineated using anatomical landmarks, e.g. using the ESTRO delineation atlas (2), since the nodes are not visible on CT. We studied the impact of SPECT-CT lymphoscintigraphy on the localisation of IMN and on the subsequent treatment planning and dose distribution.

**Material and Methods:** For 10 breast cancer patients (5 right, 5 left), SPECT-CT lymphoscintigraphy of the IMN was performed. Using the Eclipse TPS (Varian), the SPECT-CT and planning CT images were co-registered. The 70% of the maximum uptake value was used to contour the IMN on SPECT-CT images. Using the ESTRO atlas, the IMN were also contoured on the planning CT images. The localisation of IMN based on the SPECT-CT images and based on the ESTRO atlas were compared, as well as treatment plans based on the two contouring methods.

**Results:** For 2 patients, no drainage to the IMN was visible. For 6 out of the remaining 8 patients, the caudal border of the IMN based on SPECT-CT was situated at the second intercostal (IC) space, whereas the ESTRO atlas prescribes to include the third or fourth IC space depending of the position of the tumour in the breast. In the lateral direction, the lymph nodes mostly follow the veins, but for one patient, the position on SPECT-CT was more medial (and missed by the ESTRO atlas) and for one more lateral. On treatment planning, for one patient only 50% of the IMN seen on SPECT-CT would have been covered following contouring using the ESTRO atlas. The mean heart dose (MHD) increased by 0.8 Gy for one patient and decreased by 1.0 Gy for one patient and the mean lung dose (MLD) decreased by 2 Gy for one of the patients following SPECT-CT based delineation. For the other patients, the differences in MHD and MLD were less than 0.5 Gy.

**Conclusion:** Delineation of the IMN using SPECT-CT lymphoscintigraphy is easier and less user dependent than using the delineation atlas. In general, the agreement between atlas and SPECT-CT based delineation is good. However, the caudal border of the IMN was overestimated in 6 out of 8 patients. Differences in the medial border were also observed, resulting in underdosage of the IMN in 1 and overdose to lung and heart in 1 other patient. SPECT-CT lymphoscintigraphy might be applied for patients with a high heart dose, to investigate whether the caudal and medial border of the IMN may be reduced.