

the conventional imaging modalities were also detected by FDG-PET-CT scan. In a total of 14 patients additional lesions were found. In half of these patients the treatment plan was changed (2x no operation, 2x no adjuvant chemotherapy, 4x adaption of radiotherapy).

Conclusion: A 18F-FDG PET-CT is more accurate than the usual conventional imaging techniques in staging patients with advanced breast cancer. In our experience therapy can be more accurately planned.

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Poster

Combination of Breast Scintigraphy and Ultrasound is Promising Tool for Diagnosis and Staging of Breast Cancer

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Purpose: To evaluate diagnostic accuracy of breast scintigraphy (BrSc), ultrasound (US) and their combination in diagnosis and staging of primary breast cancer (BC).

Material and Methods: We studied 132 consecutive patients (pts) with clinical and/or radiological suspicion for BC. BrSc was performed 15 min after i/v injection of 740–860 MBq of 99mTc-sestaMIBI. Images with focal and scattered patchy uptake were scored as abnormal. Focal areas of tracer accumulation in axial region were considered as signs of lymph node metastases (LNM). High frequency digital wide field of view US was performed by experienced radiologist. Following signs were considered abnormal: irregular morphology, poorly defined edges, inhomogeneous echo structure, posterior acoustic attenuation, hyperechogenicity. Nodes with diameter more than 1 cm were considered abnormal. All breast lesions and LNs were verified by biopsy and follow-up or by operation.

Results: BrSc demonstrated high diagnostic value in 132 evaluated pts with following sensitivity (Sen), specificity (Sp) and accuracy (Ac): 94% (105/112), 68% (7/21), 90%. In 35 pts with lesions below 11 mm Sen of BrSc dropped to 86% (12/14), Sp reached 76% (16/21) and Ac 80%. In this group diagnostic value of US was as follows: Sen 57% (8/14), Sp 100%, Ac 82%. Combination of BrSc and US resulted in excellent Sen (100%) with moderate Sp (76%) and Ac (82%).

BrSc had moderate efficacy in diagnosis of axillary LNM with Sen – 74%, Sp – 75% and Ac – 74%. US demonstrated comparable figures: Sen – 79%, Sp – 77%, Ac – 77%.

When LNM were diagnosed as the combination of concordantly abnormal US and scintigraphy examinations Sp reached 96%, Sen dropped to 52% and Ac remained at 79%. If LNM were diagnosed in all patients with abnormal US or axillary LN scintigraphy Sen raised to 87% with Sp – 68% and Ac – 78%.

Conclusions:

1. Combination of BrSc and US can significantly improve Sen (100%) in patients with small (below 11 mm) breast lesions.
2. In diagnosis of axillary LNM BrSc with US help to increase Sen (87%) or Sp (96%). Final result is determined by chosen diagnostic strategy.

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Poster

Retrospective Comparison of the Accuracy of two Different Computer Aided Detection Systems for Detecting Malignant Lesions on Mammography

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Background: To retrospectively compare the accuracy of two computer aided detection (CAD) systems (SecondLook versus AccuDetect Galileo) for the detection of malignant breast lesions on full-field digital mammograms.

Material and Methods: Digital mammograms of 326 patients were analysed (117 patients with biopsy proven breast cancer, 209 negative cases). Positive cases consisted of 85 masses, 6 calcifications, and 26 masses plus calcifications. Twelve month follow-up was available for all negative cases. Each set of cases was read by both CAD systems and true positive fraction (TPF) for both systems and per image, case, and total cancers was assessed. Operating points for both systems was set at approximately the same false positive rates per image and case. One-sided, exact McNemar's tests were used to assess statistical significance of the results.

Results: When compared to SecondLook, AccuDetect Galileo significantly increased TPF per image for masses (increase of 10.6% to 72.2%, $p = 0.0001$) and calcifications (increase of 12.8% to 61.5%, $p = 0.03$). Per case, AccuDetect Galileo did not significantly increase TPF for masses and

calcifications. More importantly, AccuDetect Galileo achieved higher TPF for all cancers (per image increase to 6.9% to 72.2%; per case increase to 4.3% to 84.6%). Interestingly, AccuDetect Galileo had a significant performance improvement in detecting masses on extremely dense breasts (qualitative BI-RADS breast density class 4) over SecondLook, increasing TPF with 15.4% to 69.2% ($p = 0.0156$).

Conclusions: AccuDetect Galileo showed better overall performance than SecondLook in detecting masses, microcalcifications and all cancer types, especially in extremely dense breasts.

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Poster

Comparison of Different Vacuum Assisted Breast Biopsy Methods – A Time-based Analysis

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Background: Minimally invasive biopsy is the standard of care for the diagnosis of suspicious non palpable breast lesions. Stereotactic vacuum assisted breast biopsy (VABB) with the use of devices such as Mammotome[®] is considered as an established method for the evaluation of suspicious non palpable mammographic lesions. Breast Lesion Excision System (BLES) is a new method that has been introduced for these kinds of procedures. The BLES utilizes radiofrequency in order to perform a one-pass intact specimen excision of the suspicious lesion. It has been proven that the duration of the procedure has an influence on many parameters for the patient such as pain, compliance, quality of life etc. The aim of the study was to record and compare the amount of time needed in order to complete a stereotactic VABB, with the use of Mammotome and BLES techniques respectively.

Material and Methods: From April 2010 to March 2011, 50 consecutive patients (mean age=49.8, range 35–76) underwent VABB with the use of Mammotome[®], while another 50 consecutive patients (mean age=53.3, range 33–82) underwent a biopsy with the use of BLES. Inclusion criteria consisted of suspicious non palpable mammographic lesions such as microcalcifications, asymmetric density and solid lesions, categorized as BI-RADS 4 or 5. Biopsies were performed under stereotactic image guidance by the same surgeon–radiologist team and were successful and uncomplicated in all cases. Time intervals at the beginning of the procedure, i.e. positioning the patient and performing the stereotaxis, the anesthesia injection, the needle/basket withdrawal and at the end of the procedure were recorded and analysed.

Results: Breast biopsies conducted with the use of Mammotome[®] resulted in anesthesia injection at 15.5±9.6 min and needle withdrawal at 30.7±11 min later, while the total procedure lasted 46.2±13.4 min. On the other hand, biopsies conducted with the use of BLES resulted in anesthesia injection at 13.5±5.3 min, the basket was withdrawn after 9.8±3.8 and the total procedure lasted 28.2±6.6 min. Overall, there was no statistically significant difference between the two procedures in the amount of time required to appropriately position the patient and perform the stereotaxis. Nevertheless, the duration of the invasive part of the biopsy as well as the overall procedure time were significantly shorter ($p < 0.0001$) in biopsies that were performed using the BLES.

Conclusion: According to our initial experience, the BLES device is a simple and time-saving diagnostic breast biopsy system. Patients undergoing a breast biopsy with the BLES might find it less inconvenient compared to Mammotome, due to shorter duration of the procedure. However, the choice of Mammotome[®] over the BLES or vice versa as a diagnostic procedure for non palpable mammographic lesions should be made based on objective criteria such as the morphology, size and location of the lesion rather than the estimated duration of the procedure itself.

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Poster

Identification of Sentinel Lymph Node Metastasis and Axillary Status in Early Breast Cancer by Indocyanine Green Fluorescence Method

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Background: Indocyanine green (ICG) fluorescence detection has been shown to be superior to blue dye in terms of the number of sentinel

lymph nodes (SLNs) identified and the detection rate in early-stage breast cancer (Sugie T. et al., ASCO2011 abstract #1122). This technique allows visualization of the first SLN as a real-time image from outside the body and enables orderly and sequential dissection along the lymphatic flow. This study evaluates the effectiveness of the ICG fluorescence method for identification of SLN metastasis and further axillary status in patients with positive SLNs.

Methods: Ninety-nine patients with early stage breast cancer received subareolar injections of both ICG and indigo carmine. Lymphatic flows were traced with a PDE camera (a charge-coupled device; Hamamatsu Photonics, Hamamatsu, Japan). Real-time image-guided surgery enabled identification of the SLN fluorescence signal. SLNs were classified according to the order in which they were removed and whether they were ICG-positive and/or blue dye-positive. In patients with positive SLNs, the status of other axillary lymph nodes was recorded after completion of axillary lymph node dissection (ALND). Identification rate of SLNs were also assessed in terms of age and body mass index (BMI).

Results: The mean age and BMI were 60 (range 29–75) years and 22.3 (range 17.6–32.4) kg/m², respectively. The mean number of SLNs removed was 3.4 (range 1–10). The ICG fluorescence technique identified 99% (98/99) of SLNs; this identification was independent of age and body mass index. Involvement of SLNs was found in 20% (20 of 98) of cases, and the ICG fluorescence technique demonstrated 100% positivity in the first SLN. Six cases were undetected by the blue dye resulting in a false negative rate of 30% (6/20). Metastases to the second or further SLNs were found in 8 patients, all of whom also had the positive first SLN. Sixteen patients underwent completion of ALND and 25% (4 of 16) of whom had metastases in the axilla. These four patients with axillary involvement had multiple positive SLNs in the second or further pier. However, there was no axillary involvement in the eight patients who had the only one nodal involvement localized in the first SLN.

Conclusion: The ICG fluorescence method leads to high rates of SLN detection even in patients with old age and obesity. SLN identified by this method accurately represents the overall axillary status. By orderly and sequential dissection, patients with isolated involvement of the first SLN can be spared subsequent ALND.

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Poster

Correlation of Computerized Quantitative MR Breast Density Measurements with Standard Qualitative ACR BIRADS Classification

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Purpose: To compare quantitative breast density measurements with MRI using the Dixon sequence with standard qualitative ACR BIRADS categorization, and to provide a range of equivalent values for each of the two methodologies.

Materials and Methods: 33 women were included in this prospective IRB-approved study and breast density was measured with MRI using the Dixon sequence at 3T Tesla (TR/TE 6ms/ 2.45ms/2.67ms, 192 slices, matrix 352 x 352, 1 mm isotropic), which acquires two datasets, one representing fatty and one fibroglandular tissue. The computerized MRI breast density measurement system calculated the percentage of fatty and fibroglandular tissue (%) and the total volume of the breast (cm³). Two breast radiologists in consensus allocated a BIRADS density category (1-0-24%; 2-25-49%, 3-50-74%, 4 >75%) to each mammogram. Descriptive statistics using the 25-75 % percentile were used to define the typical range of MRI density readings corresponding to the four BIRADS categories of breast density.

Results: Computerized MRI breast density measurements ranged from 3.5% to 60% (mean 22.3%). Compared with the BIRADS categories, 25-75% percentile assessment demonstrated an interquartile range of percentage breast density of 4.8-15.4% for BIRADS-1, 9.9-22% for BIRADS-2, 16.8-38.1% for BIRADS-3 and 30-51.2% for BIRADS-4.

Conclusion: Quantitative MRI breast density readings were consistently lower than qualitative BIRADS assessment - often by about 50 %. Equivalent values were found with computerized MRI breast density readings of 0-12.6%, 12.7-19.4%, 19.5-34.1% and >34.2% respectively for each of the four BIRADS categories.

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Poster

Breast Cancers as a Secondary Malignancy After Treatment for Hodgkin Lymphoma - Focus on HER2 Status

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Background: Radiotherapy is frequently part of a curative treatment for Hodgkin lymphoma (HL) and BC is most frequent secondary malignancy after HL diagnose.

To the best of our knowledge, it has not been explored whether BC, that could be potentially radiotherapy induced after HL, has different incidence of HER2 over expression, as compared to common BC.

Therefore, the aim of this analysis is to explore HER2 status in BC developed as a secondary malignancy after HL treatment.

Patients and Methods: From January 2000 to January 2011, 13 female patients with BC stage I-III, and previous history of HL were identified.

All have been treated for HL with chemotherapy, and 10/13 also with radiotherapy to the chest wall. HL treatment was conducted in period 1981-2004.

For BC treatment, all patients underwent radical mastectomy, postoperative chemotherapy, and hormonal therapy in 8/13. Median follow up after BC is 4 years (range 1-10).

Pathological specimens for IHC (HerceptTest Dako) were identified for 12/13. All HER2 2+ results were tested with CISH.

Results are presented in the table.

| No. | Median age et HL dg (years) | Median interval to BC (months) | Previous radiotherapy to the chest | Median age et BC dg (years) | HER2 positive (3+ CISH+) | NA |
|-----|-----------------------------------|-----------------------------------|--|-----------------------------------|-----------------------------|------|
| 13 | 26.8 (13-53) | 185.2 (72-348) | 10/13 | 43.5 (26-69) | 0/12 | 1/13 |

Conclusion: Ten patients developed BC after previous radiotherapy to the chest wall and three without previous radiotherapy for HL. There were no HER2 over expression in 12/13 samples.

Although this is a small patient subgroup, results are intriguing and suggestive that previous HL and treatment including RT to the chest wall probably does not induce more aggressive forms of BC, defined by HER2 over expression.

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Poster

The Potential of Targeting Nanoparticle for Breast Cancer Diagnosis

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Background: Nanotechnology is the exciting field focused on man-made materials in the size range of 1-100 nanometers (nm). Nanoparticles (NPs) are on the scale of many cellular-level processes and hence are attractive for targeting breast cancer (BC). Our group has reported Gold Speckled Silica NPs (GSS) as multimodal contrast agents for fluorescence, magnetic resonance and photoacoustic tomographic (PAT) imaging. The near infrared (NIR) optical absorption property of these particles makes them potentially useful for therapeutic applications such as thermal ablation of tumors. Then we have focused on the increased glucose metabolism of cancer cells, we have recently developed glucose binding NPs as targeting NPs.

Materials and Methods: We hypothesize that glucose conjugated NPs is more incorporated into cancer cells compared to normal NPs. Human breast cancer cells (BT474) were incubated with glucose conjugated NPs (2DOG-NPs) or normal NPs (as control) after 12 hours glucose free preparation. The tumor cell uptake was assessed using flow cytometry and fluorescence microscopy experiments.

Results: Uptake of 2DOG-NPs was significantly higher than uptake of normal NPs after 12 hours glucose free preparation.

Conclusion: Glucose conjugated NPs can be used as suitable targeting NPs for development of imaging agents for early diagnosis of BC. Evolving bio-nanotechnologies such as targeting NPs promise to enhance the early detection and non-invasive treatment of BC.