μl of lysate determine the node status. OSNA® results are designated as (−) no metastasis (⩽0.2 mm), (+) micrometastasis, (++) macrometastasis, (+)I positivity in the diluted sample only.

Results: 344 SLNs from 160 patients T0, T1 or T2 were analysed. OSNA® detected 15 (++), 11 (+) and 8 (+)I while respectively 13, 2 and 1 were also found positive by permanent histology leading to a positivity rate of 21.25% (34/160). The definitive histology found 5 micrometastasis while OSNA® results were (−) leading to SLN positivity rate of 25%. Additionally, Isolated tumor cells were found for 4 patients. 30 axillary node dissections have been performed in the same surgical session according to OSNA results and 8 have been delayed (6 for positive permanent histology and 2 because of intra-operative OSNA® technical delays). Non-SLNs involvement were shown for 6 patients, all were OSNA® positive. OSNA® median time analysis was 35 min for 2 SLNs and about 5 more min per additional node.

Conclusion: We are not surprised to find discordance between OSNA® and histology for micrometastasis because of the cutting protocol leading to tissue allocation bias. For macrometastasis 13/15 cases were concordant. Finally 138/160 patients are concordant, the positivity rate is 25% in agreement with the literature and our retrospective data with conventional histology practices. Therefore we are confident with the OSNA® system. OSNA® is a rapid tool for intra-operative assessment of SLN status and allowed us to avoid a recall for second axillary dissection for 30/160 patients, while only 7/160 by touch imprint.

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Does intra-operative assessment of sentinel lymph nodes cause over-running of theatre lists or cancellation of operations?

P. Mistry[1], T. Sircar[1], N. Chachlani[1], T. Preece[1], N. Davis[1], G. Thomas[1], J. Simon[1], S. Harries[1], L. Jones[1], D. Clarke[1]. *[1]South Warwickshire General hospital, Breast & General Surgery, Warwick, United Kingdom*

Background: Touch imprint cytology (TIC), is a simple intra-operative assessment of sentinel lymph node (SLN). It provides an immediate result, allowing the surgeon to proceed to an axillary lymph node clearance in patients who are positive for metastasis and avoid a second operation. However proceeding to axillary clearance needs extra theatre time and there is potential for 'over-running' and disruption of a theatre list. The aim of the study was to assess the time required for TIC and if this resulted in 'over-running' of theatre or cancellation of other operations in the theatre list.

Methods: This was a prospective audit of 53 patients who underwent SLN biopsy and TIC. Sentinel lymph node (SLN) biopsy was performed first and sent for TIC. While waiting for the results, surgeon continued with wide local excision or mastectomy. Once TIC assessment was complete the results were phoned to theatre by the pathologist. All timings were recorded prospectively.

Results: Altogether 75 SLNs were biopsied in 53 patients. The mean number of SLNs subjected to TIC for each patient was 1.4 (range 1−3). Average time from harvesting of the nodes to receiving of result of the TIC for each patient was 31 minutes (range 15−53). This was proportional to the number of nodes. Average time taken for each lymph node was 19 minutes. Prolongation of the operation due to TIC was seen in only 9 patients (17%), on an average by 6 minutes (range 1−15). 3 patients (7.4%) had positive TIC and required axillary clearance during primary procedure. 2 out of 38 (5%) theatre lists over ran due to positive TIC and axillary clearance. No operations were cancelled due to TIC.

Conclusion: Prolongation of operation was seen in only 17% of patients on an average by 6 minutes. The chance of 'over-running' of theatre list was only around 5%. No other operations in the theatre list had to be cancelled due to TIC. Thus intra-operative assessment of sentinel lymph node by TIC can be included in the routine practice without major disruption of theatre time.

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Axillary ultrasound examination is useful for selecting optimal patients suited for sentinel node biopsy after primary systemic chemotherapy

T. Shigekawa[1], H. Takeuchi[1], M. Misumi[1], N. Nakamiya[1], H. Sano[1], K. Matsura[1], T. Takahashi[1], N. Fujiuchi[1], A. Osaki[1], T. Saeki[1]. *[1]Saitama Medical University International Medical Center, Breast Oncology, Saitama, Japan*

Background: An accurate evaluation of axillary lymph node (ALN) involvement is essential for the therapeutic indication of sentinel lymph node (SLN) biopsy (SLNB). Although at present breast cancer patients are treated more frequently with primary systemic chemotherapy (PSC), the reliability of SLNB after PSC remains controversial. The aim of this study was to examine the utility of axillary ultrasound (AUS) examination for selecting optimal patients who were suitable for SLNB after PSC.

Material and Methods: Between June 2007 and October 2009, 56 patients with AJCC Stage II or III breast cancer, treated with anthracycline and/or taxane-based PSC and who underwent SLNB followed by complete ALN dissection, were enrolled for the study. All patients underwent AUS before and after PSC for axillary staging. Lymph nodes that were swollen, irregularly shaped, homogeneously hypoechoic without an echo-rich center, and/or had an abundant inflow bloodstream were defined as AUS-positive, in consideration of potentially massive nodal involvement. The preoperative diagnostic accuracy of AUS was compared with other methods such as palpation and positron emission tomography/computed tomography with ^{18}F-fluorodeoxyglucose (^{18}F-FDG PET/CT).

Results: An SLN was successfully identified in 46 patients (82%). The sensitivity of SLNB was 84.8% (28 of 33 patients) and the false-negative rate was 15.2% (5 of 33 patients).

AUS-negative patients both before and after PSC (11 patients) had a better identification rate (91%; 10 of 11 patients), sensitivity (100%; 6 of 6 patients) and false-negative rate (0%; 0 of 6 patients) compared with AUS-positive patients before and/or after PSC (80%, 81.5%, and 18.5%, respectively). The results of AUS were also better than those from palpation and ^{18}F-FDG PET/CT.

Conclusion: SLNB after PSC is feasible and an accurate method for predicting the ALN status of patients who are AUS-negative both before and after PSC. AUS might be recommended for inclusion in assessments during PSC and before surgery for selecting optimal patients suited for SLNB after PSC due to its utility, easy availability, safety (no radiation exposure), and cost-effectiveness. Long-term examinations of more cases are necessary.

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Metastatic internal mammary lymph nodes in breast cancer: target patients and management implications

M. Castellarnau Visús[1], A. Garcia-Tejedor[1], M.J. Pla[1], E. Benito[1], A. Benitez[2], E. Sabrià[1], R. Ortega[3], A. Eraso[4], T. Soler[5], S. Pernas[6]. *[1]Hospital Universitari de Bellvitge, Gynaecology, L'Hospitalet de Llobregat, Barcelona, Spain; [2]Hospital Universitari de Bellvitge, Nuclear Medicine, L'Hospitalet de Llobregat, Barcelona, Spain; [3]Hospital Universitari de Bellvitge, Radiology, L'Hospitalet de Llobregat, Barcelona, Spain; [4]Catalan Oncology Institute, Radiotheraphy, L'Hospitalet de Llobregat, Barcelona, Spain; [5]Hospital Universitari de Bellvitge, Pathology, L'Hospitalet de Llobregat, Barcelona, Spain; [6]Catalan Oncology Institute, Medical Oncology, L'Hospitalet de Llobregat, Barcelona, Spain*

Background: Management of internal mammary sentinel nodes (IMN) in breast cancer is controversial.

We evaluate the target patients of metastatic IMN and we assess its effect on staging, prognosis and treatment of breast cancer.

Material and Methods: We have performed a retrospective study on T1-T2N0 breast cancer patients with lymphoscintigraphic drainage and surgical approach to IMN at the Bellvitge Universitary Hospital from 2000 to 2004. Two groups were considered: positive and negative IMN. Specific tumor characteristics, treatment modification, disease-free survival (DFS) and overall survival (OS) were contrasted by Fisher exact test.

Results: From 682 lymphoscintigraphy performed, 61 IMN drainage were seen and surgical approach was completed in 27 patients. Six patients (22%) had metastatic IMN. Analyses of patients and breast cancer characteristics in both groups are presented in the table.

	IMN	
	Positive	Negative
Mean age	47	48
Premenopausal status	66%	50%
Inner quadrant localization	83%	38%
Histological grade III	**83%**	**28%**
Mean tumor size	16.1 mm	16.6 mm
Invasive ductal carcinoma	100%	95%
Metastatic axillary nodes	0	10.5%
Adjuvant chemotherapy	**100%**	**57%**
IM Radiotherapy	**50%**	**0%**
Adjuvant hormonotherapy	100%	81%
DFS	100%	91.5%
OS	100%	100%

Positive IMN modified treatment in 4 cases (80%) by adding CT (2 cases) or RT (2 cases). Average follow up was 57.5 months.

Differences between both groups in histologic grade and IMN irradiation have statistical significance, whereas tumor localization, histology, metastatic axillary nodes, adjuvant chemotheraphy or hormonotheraphy, DFS and OS are not statiscally significant. Possible statistically significant differences can be hidden because of a small positive IMN sample.

Conclusions: Metastatic IMN in breast cancer is rare and can be influenced by some factors: breast tumor location, size or histopathological grade. Sampling the IMN can be necessary to obtain complete staging. Without IMN surgical approach, 22% of our patients would have been under-staged and 80% under-treated. IMN affection means a higher breast cancer stage and usually involves an aggressive treatment, what could increase DFS and OS. More studies are needed to increase the number of patients and confirm our data.

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Influence of the type of breast cancer surgery on the upper limb function

N. Kobayashi[1], C. Yoneda[2], H. Hanada[1], E. Saittoh[2], T. Utsumi[2]. *[1]Fujita Health University, Breast surgery, Toyoake, Japan; [2]Fujita Health University, Rehabilitation Medicine, Toyoake, Japan*

Background: Sentinel lymph node biopsy (SLNB) is widely accepted as an excellent method in the management of early breast cancer in patients with clinically negative axillary lymph nodes. Because SLNB requires less invasive surgery to the axilla than axillary lymph node dissection (ALND), it was assumed to result in reduced shoulder mobility. The aim of this study was to evaluate the relationship between the type of breast cancer surgery and early postoperative arm mobility.

Materials and Methods: The study group consisted of 361 consecutive patients, aged 28 to 86 years (median age 57) with breast cancer, operated upon in the Department of Breast Surgery and evaluated in the Department of Rehabilitation Medicine afterward, between February 2005 and April 2009. Out of the 361 patients, 169 (46.8% − group 1) underwent breast conserving therapy with SLNB, 78 (21.6% − group 2) simple mastectomy with SLNB, 54 (15.0% − group 3) breast conserving therapy with ALND and 60 (16.6% − group 4) modified radical mastectomy. Upper limb function was evaluated one day before surgery and 3 days, 1 month, and 3 months after surgery. In this study assessment consisted of shoulder flexion and shoulder abduction.

Results: After 3 days, a significant impairment of shoulder flexion and abduction was measured and patients in the ALND group (group 3 and 4) had more limitations in shoulder mobility than patients in the SLNB group (group1 and 2) [shoulder flexion: 95.2±32.7 degree (ALND group) vs. 118.9±36.6 degree (SLNB group), $p < 0.001$, shoulder abduction: 87.2±32.4 degree (ALND group) vs. 112.9±42.1 degree (SLNB group), $p < 0.001$]. After 1 month, ALND patients had more limitations in shoulder mobility than SLNB patients [shoulder flexion: 142.2±24.6 degree (ALND group) vs. 161.8±21.3 degree (SLNB group), $p < 0.001$, shoulder abduction: 136.6±35.3 degree (ALND group) vs. 159.4±30.2 degree (SLNB group), $p < 0.001$]. After 3 months, shoulder mobility was not different between the ALND group ($n = 44$) and the SLNB group ($n = 84$).

Conclusions: In terms of upper limb functional status, the benefits of SLNB over ALND was observed at the early postoperative time. However, long-term effects have to be confirmed by further, larger series.

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Preliminary experiences of sentinel lymph node biopsy for early breast cancer by a new camera system simultaneously capturing color and near-infrared fluorescence

T. Sugimoto[1], T. Sato[2], N. Hokimoto[1], T. Funakoshi[1], M. Inoue[1], H. Ogata[1], K. Hanazaki[1]. *[1]Kochi Medical School, Surgery 1, Kochi, Japan; [2]Kochi Medical School, Cadiovascular Control, Kochi, Japan*

Background: Sentinel lymph node biopsy (SLNB) for early breast cancer has already become a standard of care, alternating axillary lymph nodes dissection. The most common methods for identifying sentinel lymph node (SLN) are a blue dye and/or radioisotope (RI) method. However, a dye method requires special surgical training to maintain high identification rate of SLN and an RI method requires a radiation control area. A new method, based on the near-infrared (NIR) fluorescence of indocyanine green (ICG) dye, might be considered to be a new alternative to resolve these problems of conventional dye and RI methods. By providing direct visual images of lymphatic flow over skin, it makes a dye method easier and more accurate. We developed a new camera system for simultaneous capturing of color and NIR fluorescence to visualize ICG-enhanced structures against a background of vivid tissue color. We named our new camera system Hyper Eye Medical System (HEMS).

Materials and Methods: A combination of custom-made optical filters for attenuation of visible light and enhancement of NIR fluorescence was mounted on an ultra-high sensitive color CCD image sensor. A light source for excitation of ICG dye was made with an array of light emitting diodes (LED) at 780 nm.

Between April 2007 and August 2009, we performed SLNB in 113 patients with histologically confirmed breast cancer, tumor size $\leqslant 3$ cm and clinically node negative, using HEMS. After ICG dye (1.25 mg/body) was subdermally injected in the subareolar site, the subcutaneous lymphatic drainage pathway was observed on the color monitor and the site of skin incision was decided. Simultaneously, usual combination methods of indigo carmine dye and RI with 99m-Tc Sn colloid were performed in all patients.

Results: In all of 113 patients, SLNs were identified by NIR fluorescence. This result was equal to those of simultaneously performed dye and RI methods. Moreover, the images, acquired using HMES, can be used as an intra-operative navigator.

Conclusion: Fluorescence method using HMES, which can simultaneously capture color and NIR fluorescence, is expected to be a new alternative to conventional dye and/or RI methods.

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Blue dye alone in sentinel node biopsy is a safe and accurate technique in selected early breast cancer − a single institution experience

A.P.H. Tang[1], P. Iau[1], S.A. Buhari[1]. *[1]National University Hospital, Breast Surgical Services Department of Surgery, Singapore, Singapore*

Aim: To assess the safety and efficacy of sentinel node biopsy in selected cases of early breast cancer in a single institution using the blue dye method only.

Materials and Methods: Histologically proven invasive breast cancer with an a priori predictive lymph node positivity of 20% were offered sentinel lymph node biopsy (SLNB) using a blue dye only method. 220 consecutive patients from April 2002 till April 2007 with early breast cancer who fit the criteria were prospectively entered into this study. SLNB using blue dye alone was performed in all the patients. Those with any invasive cancer in the SLNB proceeded to have an Axillary Lymph Node Dissection (ALND). This includes those positive on frozen section as well as on definitive histology, including immunohistochemistry. Those in which no SLNB were found proceeded to have an ALND.

Results: Most studies utilizing a dual method of SLNB report axillary recurrence after negative SLNB at 1% or less after a median follow up of 2−3years. With a conservative estimate of recurrence in this study of 4%, with an a=0.05 and b=0.9, the sample size necessary would be 154. We thus anticipate that 200 patients would be needed for a difference in the blue dye alone SLNB compared to the dual method, if any, is to be apparent.

In our experience, we had an identification rate of 94% (207/220). Of those identified, 21% (45/207) was positive for invasive cancer on frozen section. A further 8 SLND were positive only on final histology. With a median follow up of 49.5 months (range 7−74 months), there were no axillary recurrences and 2 patients with breast only local recurrence. 1 patient subsequently developed metastatic bone disease 49 months after initial treatment and is still alive. One patient had a subsequent diagnosis of leukemia and died due to leukemia related causes.

Conclusion: Blue dye only technique is safe, and in experienced hands has comparable results to published combined techniques.

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Validation of the MSKCC nomogram to predict sentinel lymph node metastases in a Dutch breast cancer population

R. van la Parra[1], C. Francissen[1], P.G. Peer[2], M.F. Ernst[3], D. Mulder[4], W.K. de Roos[1], K. Bosscha[3]. *[1]Gelderse Vallei Hospital, Department of Surgery, Ede, The Netherlands; [2]University Nijmegen Medical Center, Department of Epidemiology Biostatistics and Health Technology Assessment, Nijmegen, The Netherlands; [3]Jeroen Bosch Hospital, Department of Surgery, 's Hertogenbosch, The Netherlands; [4]Rijnstate hospital, Department of Pathology, Arnhem, The Netherlands*

Background: The Memorial Sloan-Kettering Cancer Center (MSKCC) developed a nomogram to predict the likelihood of sentinel lymph node (SLN) metastases in breast cancer patients. The nomogram was validated on a Dutch population.

Methods: Data of 716 breast cancer patients who underwent a successful SLN biopsy were collected. Positive SLN metastases were found in 204 patients. Frozen section, serial haematoxylin and eosin (HE) and immunohistochemistry (IHC) were performed routinely on each sentinel node. A ROC curve was drawn and the area under the curve was calculated to assess the discriminative power of the nomogram.

Results: Tumour size ($p = 0.000$), multifocality ($p = 0.038$) and lympho-vascular invasion ($p = 0.000$) were identified as independent predictors of