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ORAL PRESENTATIONS

1

Prognosis of small screen-detected invasive breast cancers

I Ellis
Department of Histopathology, Nottingham City Hospital, Nottingham, UK
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The emphasis of mammographic breast screening is to detect small invasive breast cancers at a time in their natural history when early detection and treatment will reduce significantly the risk of death. However, breast screening cannot be absolutely specific in its approach and detects a wide spectrum of breast cancer, ranging from microfocal low-grade ductal carcinoma *in situ* to large high-grade invasive cancer. It is well recognized that many of the low-grade, special invasive cancers identified at screening have an excellent prognosis but may be so indolent that they would never have presented clinically or have threatened the life of the patients. It has been proposed alternatively that a proportion of these low-grade invasive tumours might, if not detected, de-differentiate over time into more aggressive, less well-differentiated tumours. Identification and removal of such cancers when they are at a low grade would avoid such progression. Detection of high-grade invasive cancers when they are small is clearly a means by which screening could reduce breast cancer mortality; for example, the Two-County Trial in Sweden has shown that histological grade 3 invasive cancers detected when <10 mm have an excellent prognosis, while it is widely recognized that large high-grade invasive cancers have a poor prognosis. In addition, the presence of vascular invasion and lymph node metastasis, which are associated with development of metastatic disease, are rare in grade 3 tumours <10 mm, grade 2 tumours <10 mm and grade 1 tumours <20 mm, indicating that detecting tumours under a certain size should be beneficial.

2

Positron emission tomography in breast disease

B Sharma
The Royal Marsden Hospital, London and Surrey, UK
Breast Cancer Res 2008, **10(Suppl 3):**P2 (doi: 10.1186/bcr2000)

Functional imaging techniques including positron emission tomography/computed tomography (PET/CT) are now increasingly being used for oncological patient management. Knowledge of the strengths and weaknesses of this evolving technique is critical for appropriate and optimal patient management. A state of the art presentation is provided to demonstrate the role of PET/CT in breast cancer, with a literature review and practical clinical patient examples from our very extensive experience of imaging in breast cancer.

Current PET/CT does not have a sufficiently high accuracy for the diagnosis of primary breast cancer or for routine axillary nodal staging. Worldwide literature and our own experience show the converse to be true for metastatic breast cancer, PET/CT now being recognised as the most accurate single imaging modality to define/stage metastatic breast disease. The role of PET/CT in the patient pathway, with specific comparison with triple assessment, CT, magnetic resonance imaging and MDP bone scan is addressed. The accuracy of PET/CT for evaluation of nodal, visceral (including liver disease, brachial plexopathy and for pre/post-radio-frequency ablation evaluation) and bony disease is discussed. The important use of PET/CT for response assessment, specifically for bone disease, and its use in guiding management (re. hormone therapy, chemotherapy and radiotherapy) are highlighted. The development of more specific PET tracers, targeting the oestrogen receptor, is also discussed.

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3

Ultra-small iron particle-enhanced magnetic resonance imaging of axillary lymph nodes in breast cancer

TH Helbiech
Department of Medical Imaging, UHN/MSH/WCH, University of Toronto, Princess Margaret Hospital, Toronto, Canada
Breast Cancer Res 2008, **10(Suppl 3):**P3 (doi: 10.1186/bcr2001)

Objective To report the diagnostic value of ultra-small iron particle (USPIO)-enhanced magnetic resonance imaging (MRI) in the detection of axillary lymph node metastases in patients with breast carcinomas.

Methods Patients with breast carcinomas were enrolled in a prospective phase III study. MRI of the axilla was performed at 1 Tesla prior to and 24 to 36 hours after intravenous administration of USPIO (Sinerem®; Guerbet, France). MRI sequences were performed pre and post USPIO administration (axial T1 3D FFE, axial and sagittal T2* FFE, and T2 TSE). Imaging results were compared with histopathologic findings.

Results A total of 154 lymph nodes were detected equally by pre and post USPIO-MRI. USPIO-MRI revealed a node-by-node sensitivity, specificity, and accuracy of 92%, 99%, and 98%, respectively. USPIO-enhanced MRI did not miss any lymph node metastases in a patient-by-patient correlation.

Conclusion USPIO-MRI is a valuable method in the assessment of axillary lymph node metastases in patients with breast carcinomas and has potential as a noninvasive sentinel lymph node technique.

4
Ultrasound elastography

G Rizzatto
General Hospital, Via Vittorio Veneto, Gorizia, Italy
Breast Cancer Res 2008, **10(Suppl 3):**P4 (doi: 10.1186/bcr2002)

Real-time elastography (RTE) of the breast is accurate and reproducible, and may easily and quickly integrate conventional ultrasound and other breast imaging.

We use a new five-step score that modifies the original Tsukuba classification. In fact, this last score is related only to solid lesions while the BI-RADS Breast Imaging Reporting and Data System considers also nonsolid lesions; in our practice we observed that the cysts always show a typical three-layered pattern.

This pattern is due to an artifact. With RTE scanning, many elasticity images are obtained by comparing two adjacent frames to evaluate the displacement generated by the probe with continuous compression and relaxation movements. The displacement of these two adjacent frames is usually small (<0.5 mm). The echo intensity inside the cyst is extremely low. The displacement at the center is erroneously estimated as almost 0 and is represented as a green band. The two areas near the cystic wall have a different displacement value, with a strain that is lower in the front (blue) and higher in the back (red).

RTE shows a very high specificity in benign lesions, including BI-RADS category 3 lesions. With the best cutoff point between elasticity scores 3 and 4, the negative predictive value is around 98%. RTE works better with small lesions. RTE is insensitive to the thickness and the echogenicity of the breast, and to the depth and the size of the lesion.

RTE scores are well reproducible. Indexes of intra-observer ($\kappa = 0.93$) and inter-observer ($\kappa = 0.90$) agreement are very good.

5
Minimising surgical treatment of early breast cancer

R Rainsbury
The Royal Hampshire County Hospital, Winchester, UK
Breast Cancer Res 2008, **10(Suppl 3):**P5 (doi: 10.1186/bcr2003)

Introduction Breast-sparing oncoplastic procedures (BSOP) offer a radical new alternative to mastectomy and conventional breast-conserving surgery in early breast cancer treatment. Wider clearance reduces local recurrence, with a direct impact on long-term survival [1]. Loss of volume is the leading cause of breast deformity, especially for central, medial and inferior tumours [2]. BSOP require the simultaneous deployment of oncological and reconstructive skills, and the emergence of oncoplastic surgeons is increasing the availability of these procedures in clinical practice [3].

Indications BSOP are most appropriate when resecting 20% to 50% of the breast volume [4], when the likelihood of major deformity escalates [2]. New assessment tools enable direct calculation of the volume loss [2], and this approach is proving a useful alternative to total mastectomy and immediate reconstruction in patients requiring postmastectomy radiotherapy [5]. These techniques allow extremely wide local excision while minimising the sensory and structural disturbance following total mastectomy [6]. The techniques avoid the sequelae of implant-based procedures and enjoy the benefits of autologous reconstruction.

Choice of technique BSOP encompass two fundamentally different approaches. Firstly, volume displacement techniques, which transpose local breast flaps into the resection defect and are most suitable for medium to large, ptotic breasts. Secondly, volume replacement techniques, which transpose autologous tissues from extramammary sites, and are most suitable for women with small to medium-sized breasts who wish to avoid volume loss. Both techniques adapt conventional methods of breast reduction or reconstruction to avoid the need for mastectomy, and a variety of volume displacement and volume replacement techniques have been described [7].

Outcomes For volume displacement, 11 retrospective studies involving 433 patients have reported local recurrence rates of 0% to 7% and cosmetic failure rates of 0% to 18% at a median follow-up of 21 to 54 months. For volume replacement, seven studies involving 189 patients have reported local recurrence rates of 0% to 5% and cosmetic failure rates of 0% to 9%, with a median follow-up of 24 to 53 months [7]. The clinical utility of BSOP awaits further assessment and the wider availability of oncoplastic skills [8].

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6
Minimising oncological treatment of early breast cancer

J Yarnold
Academic Radiotherapy Unit, Royal Marsden NHS Trust, Sutton, UK
Breast Cancer Res 2008, **10(Suppl 3):**P6 (doi: 10.1186/bcr2004)

Recommendations for adjuvant systemic therapies are based on estimates of life expectancy (prognostic markers) and of benefit to therapy (predictive markers). The oestrogen receptor is a classic predictive marker guiding use of anti-oestrogen therapy, and expression profiling appears to select patients more or less likely to benefit. Expression profiling is also under evaluation as a prognostic marker to identify patients who do not need cytotoxic chemotherapy (MINDACT trial). Biological therapy with trastuzumab is prescribed on the basis of a predictive test for over-expression of the target growth factor receptor protein, HER2. The ER- PR- HER2- subgroup identifies patients who may benefit selectively from platinum compounds. In radiotherapy, there is also a trend towards delivering fewer, larger fractions of breast radiotherapy to a lower total dose than the historical standard 50 Gy in 25 fractions. Partial breast radiotherapy is under test as a safe and effective alternative to whole-breast radiotherapy for women with low-risk disease, a measure that is also likely to reduce iatrogenic morbidity in long-term survivors. Finally, the identification of subgroups in which radiotherapy can be safely withheld remains a research priority, with age as the single most powerful factor predicting risk of local relapse.

7

Promoting early presentation of breast cancer

AJ Ramirez
Cancer Research UK London Psychosocial Group, King's College London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P7 (doi: 10.1186/bcr2005)

Amongst patients with breast cancer there is strong evidence that delays in excess of 3 months between onset of symptoms and diagnosis/treatment are associated with worse survival rates than shorter delays. The predominant risk factors for patient delays in breast cancer include lack of awareness that breast symptoms could be due to cancer and lack of awareness of personal risk.

Ideally an intervention to reduce delayed presentation of breast cancer would promote early help-seeking behaviour by patients at high risk of having cancer, but would not promote anxiety amongst people at low risk. It is important that patients should not be made unnecessarily anxious, and nor should general practitioners be overburdened with consultations with the worried well population. Based on the empirical evidence for the risk factors for patient delay and using effective behavioural change techniques, we have developed and are evaluating a psycho-educational intervention to promote early presentation of breast cancer by older women. We have focused our intervention on older women who are at greater risk of breast cancer and are also more likely to delay their presentation. The intervention is delivered by trained diagnostic radiographers at the point when the women leave the routine protection afforded by the National Health Service Breast Screening Programme and is in line with government recommended practice and complementary to the Breast Screening Programme. The ultimate aim of the intervention is to reduce the proportion of older women with breast cancer who delay their presentation, and thereby save lives.

I will outline this work and other current initiatives within the United Kingdom to promote awareness and early presentation of breast cancer and how these might inform the development of policy initiatives to improve outcomes for patients within the National Health Service.

8

Magnetic resonance imaging of ductal carcinoma *in situ*

C Kuhl
Department of Radiology, University of Bonn, Germany
Breast Cancer Res 2008, **10(Suppl 3):**P8 (doi: 10.1186/bcr2006)

Intraductal cancer or ductal carcinoma *in situ* (DCIS) has been considered a mammographic disease. Before the advent of mammographic screening, only about 2% to 5% of breast cancers were diagnosed in the intraductal stage. Magnetic resonance imaging (MRI) has traditionally been considered insensitive for DCIS. More recent studies, however, suggest that, with appropriate diagnostic criteria, contrast-enhanced MRI may be a very sensitive tool for diagnosing DCIS, especially high-grade DCIS. In addition, MRI has been shown to be superior to delineate the intraductal extension of invasive cancers – another reason why preoperative staging with MRI is important. The likelihood with which the mammographic diagnosis of DCIS or DCIS components fails does not correlate with mammographic breast density – in other words, a missed mammographic diagnosis of DCIS is also conceivable in women with involuted breast. The present lecture summarizes the current level of evidence, and discusses the clinical implications of these findings.

9

Introduction to proton (^{1}H) magnetic resonance spectroscopy of the breast

L Bartella
Eastside Diagnostic Imaging, Manhattan, New York, USA
Breast Cancer Res 2008, **10(Suppl 3):**P9 (doi: 10.1186/bcr2007)

Proton magnetic resonance spectroscopy (^{1}H MRS) provides biochemical information about the tissue under investigation. The diagnostic value of ^{1}H MRS in cancer is typically based on the detection of elevated levels of choline compounds, which is a marker of active tumor [1]. Breast ^{1}H MRS is performed on a clinical magnet of 1.5 T or higher in field strength. A four or more channel breast coil is also needed, just as for imaging. The most widely used technique is the single voxel technique, which is limited to scan one lesion at a time. Magnetic resonance spectroscopic imaging provides information about the spatial distribution of metabolites and is useful for studying multiple lesions [2,3]. The two main potential clinical applications of ^{1}H MRS include its use as an adjunct to breast MRI to improve the specificity in differentiating benign from malignant lesions and in monitoring or even predicting response to treatment in patients undergoing neoadjuvant chemotherapy. Studies have suggested that ^{1}H MRS may decrease the number of benign biopsies recommended by MRI [4,5]. Also, in patients undergoing neoadjuvant chemotherapy, ^{1}H MRS may be able to predict response as early as 24 hours after the first dose [6]. Currently, several limitations exist that make the technique premature for clinical use [7]. Preliminary data are promising, warranting further evaluation with larger, preferably multicenter, trials.

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10

Magnetic resonance imaging in breast cancer: results of the COMICE trial

L Turnbull
Centre for MR Investigation, Hull Royal Infirmary, Hull, UK
Breast Cancer Res 2008, **10(Suppl 3):**P10 (doi: 10.1186/bcr2008)

The role of the addition of magnetic resonance imaging (MRI) to routine techniques for locoregional staging of primary breast

cancer is unclear. The COMICE trial considered whether adding a MRI scan to conventional triple assessment (mammogram, ultrasound and biopsy) assisted locoregional staging, and thereby reduced reoperation rates, for patients with primary breast cancer scheduled for wide local excision.

The primary endpoint of the COMICE trial considered the proportion of patients undergoing a repeat operation or mastectomy at further surgery within 6 months of randomisation, or an avoidable mastectomy at initial surgery (reoperation rate). This was compared using logistic regression adjusting for age, breast density, and surgeon.

Between December 2001 and January 2007, 1,625 patients were randomised to receive MRI (n = 817) or not (n = 808). The reoperation rate within 6 months (primary outcome) was 18.8% (MRI) and 19.3% (no MRI). No significant difference between the arms was detected (odds ratio = 0.96, 95% CI = (0.75, 1.24), P = 0.7691). Secondary endpoints included quality of life, imaging effectiveness and local recurrence.

The results of the COMICE trial indicate no significant benefit in terms of reduction in reoperation rates by the addition of MRI to conventional triple assessment for this patient group. These results have importance from both health economic and patient burden perspectives.

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11

Three-dimensional mammography

MJ Yaffe
Imaging Research Program, Sunnybrook Health Sciences Centre, University of Toronto, Canada
Breast Cancer Res 2008, **10(Suppl 3):**P11 (doi: 10.1186/bcr2009)

The contribution of screening mammography to reducing mortality due to breast cancer in women over 40 years old has been clearly demonstrated. Nevertheless, film mammography has several technical limitations that diminish its performance in women with dense breasts. Digital mammography goes part of the way to overcoming these limitations, but its diagnostic accuracy can still be impaired by superposition of fibroglandular structures at different levels within the breast. It may be possible to improve sensitivity and specificity further by producing tomographic images of the breast through one of two new techniques, tomosynthesis or breast computed tomography. Tomosynthesis can be carried out on a modified digital mammography system in which the X-ray tube can be rotated about the breast to obtain a number of projection views over a range of different angles. The images are obtained from these projections by mathematical reconstruction. Computed tomography requires a dedicated gantry that allows a full rotation of the X-ray beam about the pendant breast as the woman lies prone on a table. Each of these imaging methods isolates structures within the breast, potentially making tumours and microcalcifications more conspicuous. Each technique has its strengths and weaknesses with respect to radiation dose and various aspects of image quality, and these will be discussed in the current presentation. In addition, trials underway to evaluate the techniques' performance will be described.

12

CADET 2 results/computer-aided detection update

F Gilbert
University of Aberdeen, UK
Breast Cancer Res 2008, **10(Suppl 3):**P12 (doi: 10.1186/bcr2010)

Computer-aided detection (CAD) systems that attract the reader's attention to potentially suspicious features on a mammogram are now in clinical use in screening mammography in the USA and some European countries. However, recent publications have debated the benefit of CAD systems in screening mammography and have highlighted the need for robust evidence from prospective randomised trials. The evidence from these studies will be reviewed, including a recently published meta-analysis of double reading versus single reading with CAD.

The CADET II trial was a prospective multicentre randomised comparison of single reading with CAD and double reading in the UK National Health Service Breast Screening Programme. Over 30,000 women (age 50 to 70 years), attending routine mammography at three UK breast screening centres, were recruited into the trial. Film batches from screening sessions were randomly assigned in a ratio of 28:1:1 to one of three film-reading regimes: double reading and single reading with CAD, or double reading only, or single reading with CAD only. The primary outcome measures were matched comparisons of the cancer detection rates and the number of women recalled for assessment by the two reading regimes. The results of the study will be presented at the conference. The implications of this study will be discussed together with further work that needs to be undertaken.

13

Contrast enhanced and dual energy mammography

MJ Yaffe
Imaging Research Program, Sunnybrook Health Sciences Centre, University of Toronto, Canada
Breast Cancer Res 2008, **10(Suppl 3):**P13 (doi: 10.1186/bcr2011)

Occasionally, a lesion is missed on mammography either because it lies within a region of dense surrounding breast tissue or because its X-ray absorption appears to be almost identical to that of the adjacent tissue. In breast magnetic resonance imaging, images acquired pre and post administration of an intravenous contrast agent (Gd DTPA) are subtracted to reveal pooling and washout of this agent in the presence of tumour angiogenesis, which occurs as a growing tumour recruits the development of new blood vessels. Breast magnetic resonance imaging has been shown to be much more sensitive than mammography in certain groups of young, high-risk women. It is possible to exploit this phenomenon using a much less costly and more accessible approach through contrast-enhanced digital mammography. Here, a nonionic iodine contrast agent is injected between pre and post contrast image acquisitions in which the X-ray beam is produced at a relatively high energy, above the K-edge of iodine. The images are subtracted, cancelling the soft-tissue contrast that is common to the two images and isolating the iodine signal in the region of angiogenesis. A series of post-contrast images can be obtained to track the kinetics of the uptake and washout. These images and the morphology of the lesion can reveal the presence, characteristics and extent of disease. Dual-energy approaches to improve speed or a combination of contrast imaging with tomosynthesis to provide three-dimensional images are also possible. The concept of this technique will be presented and some clinical cases will be shown.

14

Lesion size is a major determinant of the mammographic features of ductal carcinoma *in situ*: findings from the Sloane Project

A Evans[1], K Clements[2], A Maxwell[3], H Bishop[3], A Hanby[4], G Lawrence[2], O Kearins[2], S Pinder[5]
[1]Breast Institute, Nottingham City Hospital, Nottingham, UK; [2]West Midlands Cancer Intelligence Unit, Birmingham, UK; [3]Breast Unit, Royal Bolton Hospital, Bolton, UK; [4]Leeds Teaching Hospitals NHS Trust, Leeds, UK; [5]King's College London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P14 (doi: 10.1186/bcr2012)

The present study aims to assess the influence of lesion size on the radiological features of screen-detected ductal carcinoma *in situ* (DCIS) in Sloane Project cases.
Cases where calcification was present mammographically, and histological grade and size were available, were included. Calcific DCIS was classified radiologically as casting/linear, granular/irregular or punctate. The pathology dataset included tumour grade and size. Correlations were sought between the radiological and pathological findings and significance assessed.
A total of 1,783 cases were included. Of these, 1,128 women, 485 women and 170 women had high-grade, intermediate-grade and low-grade DCIS, respectively. Casting calcification was more frequently seen the higher the tumour grade; occurring in 58% of high-grade, 38% of intermediate-grade and 26% of low-grade cases, respectively ($P < 0.001$). However, casting calcification was also increasingly common with increasing size, irrespective of grade ($P < 0.001$). Thus casting calcifications in small (<10 mm) high-grade DCIS were seen with a similar frequency (50%) to those in moderate-sized (21 to 30 mm) intermediate-grade lesions (48%) and to those in large (>30 mm) low-grade lesions (46%).
Lesion size has a strong influence on the radiological features of calcific DCIS; small high-grade lesions often show no casting calcifications, while casting calcifications are seen in approaching one-half of large low-grade lesions. The radiological appearances alone cannot be used to predict the histological grade of DCIS.

15

Evaluating tumour response to primary radiochemotherapy in breast cancer patients: what role for breast magnetic resonance imaging?

F Thibault, MA Bollet, A Tardivon, C Malhaire, G Zemmour-Elfersi
Institut Curie, Paris, France
Breast Cancer Res 2008, **10(Suppl 3):**P15 (doi: 10.1186/bcr2013)

Objective To evaluate the accuracy of clinical examination and of three imaging modalities (mammography, ultrasound, and magnetic resonance imaging (MRI)) to assess the tumour response to a pre-operative regimen of concurrent radiochemotherapy for large breast cancers, and to anticipate the eventual complete pathologic response.
Methods Sixty breast cancer women not amenable to conserving surgery at initial presentation were accrued in a phase II study. Treatment consisted of four cycles of 5-fluorouracil–vinorelbine with, starting with the second cycle of chemotherapy, radiotherapy to the breast and regional lymph nodes. Breast-conserving surgery or mastectomy was performed 4 to 6 weeks after completion of irradiation. Imaging assessment was performed before chemotherapy and preoperatively.
Results Referring to pathologic data, the MRI assessment performed best. A 50% or greater decrease in the largest tumour diameter in MRI was linked to complete pathologic response with 81% sensitivity and 75% specificity. MRI–pathologic correlations helped understand the pitfalls in MRI interpretation that led to overestimating/underestimating some tumour responses.
Conclusion Compared with the other assessment modalities, MRI substantially improved the prediction of pathologic tumour response. Pitfalls or limits in MRI interpretation in this specific setting were better understood.

16

Evaluation of the diagnostic value of high temporal and spatial resolution morphologic, dynamic, spectroscopic and diffusion-weighted magnetic resonance imaging in patients with breast lesions at 3 T

K Pinker[1], W Bogner[1], S Gruber[1], P Szomolanyi[2], G Grabner[1], G Heinz-Peer[3], T Helbich[4], S Trattnig[1]
[1]MR Centre of Excellence, Department of Radiology, Medical University Vienna, Austria; [2]Department of Imaging Methods, Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia; [3]Department of Radiology, Medical University Vienna, Austria; [4]Department of Medical Imaging, University of Toronto, Canada
Breast Cancer Res 2008, **10(Suppl 3):**P16 (doi: 10.1186/bcr2014)

Introduction To evaluate the diagnostic value of combined high temporal and spatial resolution morphologic, dynamic, ^{1}H-spectroscopic (3D-MRSI) and diffusion-weighted magnetic resonance imaging (MRI) in patients with breast lesions at 3 T using histology as the gold standard.
Materials and methods Fifteen patients were examined on a 3 T system using a four-channel breast coil. The MRI protocol included: contrast-enhanced (CE) coronal volumetric interpolated breathhold examination with high temporal resolution (isotropic 1.7 mm, time of acquisition (TA) 11.7 seconds, 17 measurements); coronal magnetization prepared rapid gradient echo at expected maximum CE (1 mm isotropic, TA 2.03 minutes); repeated coronal volumetric interpolated breathhold examination, twice-refocused singleshot echo planar imaging sequence with inversion recovery fat-saturation employing four *b* values (TA 4.48 minutes), 3D-MRSI (10 x 10 x 10 mm^3; TA 11 minutes). The lesion morphology was assessed. Regions of interest for suspicious areas were labelled manually and evaluated for elevated choline levels, decreased apparent diffusion coefficient (ADC) values and CE kinetics.
Results Twenty-seven lesions were detected in 15 patients. Eleven lesions were diagnosed as malignant due to morphology, CE, elevated choline levels and lowered ADC values and were confirmed by histology. Sixteen lesions demonstrated monophasic or biphasic enhancement curves and no elevated choline levels or lowered ADC values, and proved to be benign by histology.
Conclusion Combined high temporal and spatial resolution morphologic, dynamic, spectroscopic and diffusion-weighted MRI of the breast provides morphologic, kinetic, metabolic and functional information of breast lesions and is a valuable tool for differentiation of benignity and malignancy.

17

Ultrasound-guided axillary node core biopsy in the staging of newly diagnosed breast cancer

P Britton[1], A Goud[1], S Barter[1], A Eleti[1], A Freeman[1], M Gaskarth[1], P Moyle[1], P Rajan[1], R Sinnatamby[1], J Slattery[1], E Provenzano[1], S Pinder[2], S Godward[3], G Wishart[1]
[1]Cambridge Breast Unit, Cambridge, UK; [2]Department of Pathology, Guy's King's Thomas's Hospital London, UK; [3]Cambridgeshire Primary Care Trust, Cambridge, UK
Breast Cancer Res 2008, **10(Suppl 3):**P17 (doi: 10.1186/bcr2015)

One hundred and thirty-nine patients with core biopsy (CB)-proven unilateral primary operable invasive breast cancer underwent axillary ultrasound. Lymph nodes were identified on ultrasound in 134 patients (96%), of which 121 (87%) underwent core biopsy. The morphology of all biopsied nodes was noted. Normal lymph node was obtained in 77 CBs, 25 (32%) of which were subsequently shown to have nodal metastases. The results are presented in Table 1. The CB sensitivity for nodes with normal ultrasound morphology was 12%, for those with unilobulated cortex was 64%, for those with multilobulated cortex was 77%, for those with absent hilum was 88% and for those with multilobulated cortex and absent hilum was 100%.
In conclusion, the present study shows that an aggressive CB policy leads to an increase in sensitivity, but of relatively modest proportions, and is at the expense of a large number of normal biopsies. CB is insensitive at detecting micrometastases. CB of nodes with a normal ultrasound morphology is of little utility.

Table 1 (abstract P17)

Number of axillas examined	139
Number of axillas where nodes identified on ultrasound	134 (96%)
Number of axillas where CB performed	121 (87%)
CB inadequate rate (%)	4.1
Lymph node-positive (surgery) (%)	52.5
CB sensitivity, all positive nodes (%)	53.4
CB sensitivity, macrometastases (%)	62.3
CB sensitivity, micrometastases (%)	8.3

18

Medico-legal issues in breast imaging

HN Purushothaman[1], JC Morel[1], E O'Flynn[1], ARM Wilson[1,2], MJ Michell[1]
[1]King's College Hospital NHS Trust, London, UK; [2]Guy's and St Thomas' Hospitals NHS Foundation Trust, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P18 (doi: 10.1186/bcr2016)

Objective To identify medicolegal issues that occur in the diagnosis and radiological management of breast disease. To propose measures to reduce the risk of patient complaints and legal action.
Methods A retrospective study was undertaken and records of 40 medicolegal investigations over a 4-year period were examined (January 2004 to December 2007). The reports were compiled by two consultant breast radiologists who are recognised experts in the field of breast diagnosis.
Results Thirty per cent of the patients in this study were <40 years of age. The most common complaint in this series was a delay in diagnosis (90%). The mean average delay in diagnosis was 17.3 months. Substandard care was cited in 60% cases, of which 66% was considered the fault of the radiologist involved. Of these cases 67% of mammograms were reported as normal or of benign features, with microcalcification being the most common mammographic sign to be missed or misinterpreted (75%).
Conclusion The commonest complaint is delay in diagnosis. Complaints are more common in the younger age group, consistent with the previous American Breast Cancer Study [1]. Microcalcification was the commonest sign in cases where there was incorrect interpretation of the radiology.

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19

Is it feasible to train diagnostic radiographers to deliver a psycho-educational intervention to promote early presentation of breast cancer amongst older women? A pilot study

C Burgess[1], P Whelehan[2], L Omar[1], L Tucker[1], L Kedge[1], A Ramirez[1]
[1]Institute of Psychiatry/King's College London, UK; [2]King's College Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P19 (doi: 10.1186/bcr2017)

Objective To develop and pilot a training programme for radiographers to deliver a psycho-educational intervention to women receiving their final invited mammogram with the National Health Service Breast Screening Programme (NHSBSP).
Background A 10-minute structured interview has been developed and tested, which aims to improve older women's knowledge about breast symptoms and personal risk, and to increase confidence to detect a breast change. The intervention is quality assured against competency ratings on the content and style of the interview.
Training model Includes didactic teaching, communication skills training, experiential learning using role-play with actors and feedback on videotaped interviews. Skills are rehearsed in a clinic setting with mentoring from trained radiographers.
Evaluation Feasibility of training in the NHSBSP was tested with four radiographers working in the South East and South West London breast screening services. Competence and confidence to deliver the interview were assessed before and after training.
Results All four radiographers completed the training programme. Three of the four radiographers were assessed as competent and all increased their confidence to deliver the intervention.
Conclusion It is feasible to train diagnostic radiographers to reliably deliver an intervention to promote early presentation of breast cancer, and thereby potentially save lives.

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Two systematic reviews to compare effects of double reading and computer-aided detection on both cancer detection and recall rate

PM Taylor, HWW Potts
University College London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P20 (doi: 10.1186/bcr2018)

There are two competing methods for improving the accuracy of a single screening radiologist: use of a computer aid (CAD) or double reading.
Bibliographic databases were searched for studies where either intervention was incorporated into routine screening work. Meta-

analyses were performed to find overall estimates of the impacts of CAD and double reading on both the cancer detection rate and the recall rate.

Ten studies were found comparing single reading with CAD to single reading. Seventeen studies were found comparing double reading to single reading. Double reading generally increases the cancer detection rate, but also the recall rate. However, double reading with arbitration increases the detection rate (95% CI = 1.02 to 1.15) and decreases the recall rate (95% CI = 0.92 to 0.96). CAD does not have a significant effect on the cancer detection rate (95% CI = 0.96 to 1.13) and increases the recall rate (95% CI = 1.09 to 1.12). However, there is considerable heterogeneity in the impact on the recall rate in both sets of studies.

There is better evidence for an improvement in the cancer detection rate with a human second reader than with CAD. Arbitration where two readers disagree also delivers a reduced recall rate, whereas CAD increases the recall rate. There are therefore strong grounds for preferring double reading with arbitration to single reading with CAD.

21

Interval cancer developing within 3 years after recall to assessment: a review of the South East Wales cases

JF Brook, J Evans, K Gower Thomas
Breast Test Wales, Cardiff, UK
Breast Cancer Res 2008, **10(Suppl 3):**P21 (doi: 10.1186/bcr2019)

Objective To review interval cancers developing after initial recall in the mammographic screening programme in South East Wales.

Methods Interval cancer data were collected from patient records where the women had been recalled to assessment at the last screening visit.

Results A total of 206 patients developed interval cancer following a normal assessment result over a 3-year period; 169 patient records were available for analysis. Fifty-six patients (33%) had false negative results on screening mammogram. Seventy-one cases (41%) were true interval cancers, nine (6%) were occult and 34 (20%) were unclassified. Of 56 false negative results, 53 were assessed for the same area and three for a different area. Patients were assessed for microcalcification (14 cases), asymmetric density (22 cases), mass (six cases), spiculate density (two cases) and distortion (nine cases). Six patients had either biopsy or cyst aspiration. Almost 90% of the interval cancers were invasive cancer. Thirty patients (55%) developed interval cancer between 12 and 24 months after screening.

Conclusion Assessment for glandular asymmetry and microcalcification should include biopsy in more cases.

22

How does the location of a satellite screening site affect uptake?

LS Wilkinson[1], S Hudson[2], J Peterson[3]
[1]South West London Breast Screening Service, St Georges Healthcare NHS Trust, London, UK; [2]Peel & Schriek Consulting Limited, London, UK; [3]Department of Geography, University College, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P22 (doi: 10.1186/bcr2020)

Introduction Following the announcement of the Cancer Reform Strategy and the anticipated introduction of digital mammography, the South West London Breast Screening Service has investigated the effect of accessibility and deprivation on uptake of screening invitation in order to inform decisions on where to site static and mobile screening facilities in future. There are currently five static sites (hospital and commercial accommodation) and one mobile van. It is known that the physical environment of the screening site may affect uptake, but the effects of poor accessibility and local deprivation are not clear.

Methods The local eligible population was analysed at Super Output Area level, equivalent to approximately 20 postcodes or 200 eligible women. Information on local deprivation (Index of Multiple Deprivation 2004), uptake (2004 to 2007), and travel time by public transport was correlated for each Super Output Area.

Results There is a weak correlation between the Index of Multiple Deprivation and uptake. The mean travel time to all screening sites was 37 minutes but there is no correlation between travel time and uptake. Uptake is lower in Super Output Areas closer to central London. This may reflect high population mobility, which leads to inaccurate information about the name and address of women eligible for screening.

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Would male radiographers have an impact on breast screening programme performance?

P Fitzpatrick[1,2], A Winston[1], T Mooney[1]
[1]National Cancer Screening Service, Dublin, Ireland; [2]University College Dublin, Ireland
Breast Cancer Res 2008, **10(Suppl 3):**P23 (doi: 10.1186/bcr2021)

There is little research regarding attitudes to male radiographers for mammography, particularly for screening. Radiographer recruitment has been a challenge for BreastCheck, the Irish Breast Screening Programme; to date, females are employed. Programme expansion to the remaining half of the target population has commenced and doubling of radiographer numbers is required.

The aim was to document attitudes to male radiographers and the effect on the programme performance parameters through a postal questionnaire completed by 85.8% of a random sample of 2,000 women recently screened by BreastCheck.

Embarrassment was the commonest likely initial reaction if male radiographers were present; greater among those at static units (45.6%) than mobile units (38.4%) and in younger women (46%) than older women (38.7%). Nine per cent would not have proceeded if the radiographer was male; 17.5% (95% CI = 15.7% to 19.4%) agreed that 'If there were male radiographers I would not return for another screening appointment'; and 18.3% were unsure. One-quarter agreed 'If I heard there could be male radiographers it would change my opinion of BreastCheck for the worse'. Response to gender was less marked when further investigations to rule out or confirm cancer were in question.

This is the largest study of this issue; the correct balance between equality and programme performance must be struck.

24

The first two years of digital mammographic screening in New Zealand

J Walker, R Beedie, A Cave
BreastScreen Waitemata Northland, Auckland, New Zealand
Breast Cancer Res 2008, **10(Suppl 3):**P24 (doi: 10.1186/bcr2022)

BreastScreen Waitemata Northland started as a new lead provider for the New Zealand breast screening service in February 2006 with a new fully digital facility and several analogue regional subsites. Some of these latter sites have subsequently been replaced by two further digital facilities, gradually changing the

proportion of digital screening mammograms from 32% to 73% of our workload over 2 years, with 53,800 women screened. This was the first digital screening site in New Zealand. We have compared the results of screening with analogue and digital technology over our first 2 years, in terms of recall rates, cancer detection rates and positive predictive value, and found no overall significant difference in any of these parameters. We have found improved detection of malignant microcalcifications with digital mammography, with a similar proportion of these malignancies that were either invasive cancer or high-grade ductal carcinoma *in situ* as those detected with analogue technology. However, we have found better detection of nonspecific densities with analogue imaging. There is a trend towards better cancer detection with analogue than digital technology in the 64 to 69 years age group, which does not reach statistical significance.

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Should prior film mammograms be digitised during the transition to digital mammography?

S Taylor-Phillips[1], MG Wallis[2], AG Gale[1]
[1]Applied Vision Research Centre, Loughborough University, Loughborough, UK; [2]Cambridge Breast Unit, Addenbrooke's Hospital, Cambridge, UK
Breast Cancer Res 2008, **10(Suppl 3):**P25 (doi: 10.1186/bcr2023)

National Health Service breast screening centres will soon make the transition to digital mammography, and how that transition is conducted may affect both performance and workflow. A trial of digitising the prior film mammograms was conducted at University Hospital (Coventry). Radiologists/advanced practitioners ($n = 8$) read screening cases for 1.5 hours in two conditions: either prior mammograms digitised (2905 digitiser at 75 μm; Array, USA) and presented onscreen alongside the current mammograms; or displayed in film format on a multiviewer. Measurements of eye movements showed readers look at the prior mammograms a greater number of times per case when digitised ($t(7) = -2.73$, $P = 0.03$). This could have implications for performance, as use of prior mammograms is known to improve performance. After the study, seven out of the eight readers expressed a preference for digitisation of prior mammograms. Digitisation was trialled at two different points in the workflow: before the screening session resulted in 30% wastage due to women not attending; and after the screening session caused a bottle-neck in workflow that slowed the screening process by approximately half a day (3 minutes per woman) in this implementation. The present study indicates that digitising prior mammograms is beneficial for readers, but may delay the production of results in the screening process.

26

The future of breast radiography: European perspective

H Rijken
National Expert and Training Centre for Breast Cancer Screening, Nijmegen, the Netherlands
Breast Cancer Res 2008, **10(Suppl 3):**P26 (doi: 10.1186/bcr2024)

Digital technology has entered the practice of mammography. In the coming years, digital mammography will be gradually implemented in most European countries and will change the practice of mammography also from the radiographer's perspective. A computed radiography system is a quick simple conversion from analogue to digital; there is little change in workflow, whereas the introduction of full field digital mammography systems using direct radiography detectors implies a significant change. The X-ray film is replaced by solid-state detectors that convert X-rays into electrical signals, producing images that can be studied instantly on a computer screen. Thus, there are no cassettes, no markers, no bucky to change, no darkroom, no waiting to check films, and no viewboxes. Digital mammography provides higher resolution, which may improve detection, but it also pronounces folds and wrinkles, due to less optimal positioning.

Considering the professional status of the radiographer, we encounter major differences in the various European countries. On the one hand, in some countries, screening radiographers are involved in film-reading and diagnostic procedures. On the other hand, the radiographer might just be the one pressing the button. Breast centres should employ well-trained specialized breast radiographers, as full members of the multidisciplinary team. They should be involved in the minimal invasive biopsy, ultrasound and magnetic resonance imaging techniques, as well as in upcoming new techniques, such as tomosynthesis, automated three-dimensional breast ultrasound, dual-energy contrast enhanced mammography, and so forth.

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The future of breast radiography: UK perspective

P Whelehan
National Breast Screening Training Centre, King's College Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P27 (doi: 10.1186/bcr2025)

The current presentation reviews the radiography career structure within the mammography speciality in the United Kingdom, focusing particularly on the National Health Service Breast Screening Programme (NHSBSP). Factors influencing role design will be discussed, including national job profiles, the professional body and NHSBSP guidance, service needs and cost-effectiveness. Barriers to developing the workforce will be considered.

Results from the 2008 National Breast Screening Programme workforce survey, currently underway, will be presented – concentrating on the consultant radiographer role, and comparing actual job specifications with those indicated in the relevant guidance and with managers' views on ideal job design.

It is postulated that while the radiography workforce has developed enormously during recent years, further development is needed to respond to current and future opportunities and challenges.

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Comparison of practitioner and assistant practitioner mammograms

A-M Fretwell
Breast Cancer Res 2008, **10(Suppl 3):**P28 (doi: 10.1186/bcr2026)

Abstract not submitted at time of publication.

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Assistant practitioner job satisfaction and retention

S Sellars
Breast Cancer Res 2008, **10(Suppl 3):**P29 (doi: 10.1186/bcr2027)

Abstract not submitted at time of publication.

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Can we manage B3 lesions better?

S Pinder
Department of Academic Oncology & Division of Cancer Studies, Guy's Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P30 (doi: 10.1186/bcr2028)

Within mammographic breast screening programmes in Europe, a categorisation for nonoperative histology reporting is used from B1 normal and B2 benign through to B5 malignant. Definitive diagnosis is possible for the majority of lesions on core biopsies, but there remains a small proportion in the borderline category of B3, uncertain malignant potential. These are lesions that are either benign but known to be associated with malignancy, or which are known to be heterogeneous and where sampling may have missed a more worrisome area.

B3 lesions include entities such as radial scars, papillary lesions and phyllodes tumours. Often more diagnostically difficult for the pathologist are the atypical epithelial proliferations such as atypical intraductal proliferations (akin to atypical ductal hyperplasia), lobular neoplasia and columnar cell atypia/flat epithelial atypia.

Advances have been made regarding management of some of these processes; it is established that the atypical intraductal epithelial proliferations are more frequently definitively upgraded with the use of wider gauge devices (for example, 11 G, 8 G) to ductal carcinoma *in situ*. In such cases, diagnostic excision can be avoided and therapeutic surgery undertaken. Conversely, it has been shown that some papillary lesions may be excised by mammotomy.

There are still few robust data, however, on outcome following a B3 diagnosis of lobular neoplasia or of flat epithelial atypia. The management of these lesions when identified in the core can cause controversy and debate. Collaborative data collection of the outcome of these uncommon entities is central to resolving the question of optimal clinical management.

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Comparison of vacuum biopsy systems

R Wilson
King's College Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P31 (doi: 10.1186/bcr2029)

More than 15 years ago breast radiologists recognised the limitations of fine-needle aspiration and core biopsy as methods for accurate percutaneous breast diagnosis and a variety of different devices were developed to retrieve larger needle biopsy specimens. Vacuum-assisted mammotomy (VAM) has been the most successful of these methods. While core biopsy remains the method of choice for routine needle breast biopsy, VAM is now in routine use as a proven method for minimising the sampling error of subtle and borderline breast lesions and for therapeutic excision of benign breast lesions as an alternative to surgery. VAM achieves significant 50% reduction in understaging of premalignant and malignant disease.

VAM technology has been refined in recent years and there are now four different VAM devices available. All are designed for use under X-ray and ultrasound guidance. The third-generation devices are closed systems that use larger gauge probes to ensure that ample material can be rapidly acquired.

The latest devices are designed to be used with both prone table and upright X-ray equipment, and are particularly suitable for lateral approach stereotactic biopsy. Sensitivity rates for invasive and *in situ* carcinoma of 95% to 100% are achievable and VAM should now be considered routine for most stereotactic biopsy procedures. VAM can also be used routinely in place of surgery for the excision of benign lesions and for confirmation excision of papillary lesions and radial scars.

Comparative analyses of the current VAM devices will be presented.

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Follow-up results after vacuum excision

L Hamilton
Nottingham Breast Institute, Nottingham City Hospital, Nottingham, UK
Breast Cancer Res 2008, **10(Suppl 3):**P32 (doi: 10.1186/bcr2030)

Vacuum-assisted excision biopsy (VAEB) has two current indications: the removal of fibroadenomas at patient request, and the removal of benign lesions of uncertain malignant potential (B3) where the perceived risk of upgrade is low.

As the primary aim of VAEB of fibroadenomas is patient satisfaction, we sent a postal patient satisfaction survey to all 81 women who had undergone VAEB of fibroadenomas in our unit. After two postings we achieved a 59% response rate. The main findings of the survey were that 79% of patients had complete resolution of the palpable abnormality and that 96% would recommend the procedure to others and undergo a further procedure if required. Fifty-four per cent reported no pain during the procedure and only 8% reported pain as greater than 2/10 on a visual analogue scale. Postprocedure pain during the following week, however, was rated at greater than 2/10 in 55%. The commonest complication was bruising.

Our unit offers VAEB to patients with B3 lesions where no atypia is present on core biopsy as an alternative to diagnostic surgical excision. We decided to audit the first 43 such cases to assess the upgrade rate and findings at follow-up imaging to see whether we needed to refine our selection criteria for VAEB. Twenty-five papillary lesions and 18 radial scars were excised under ultrasound control, the majority with an 8 G device. Following VAEB there were no upgrades of radial scars, but two lesions were missed due to difficulty in excising subtle ultrasound abnormalities and required wire localisation. Significant mammographic architectural distortion often remained following VAEB of radial scars. An 8% upgrade of papillary lesions was seen at final histology. A number of patients went on to develop further papillary lesions in the same area at follow-up. Some upgrades of papillary lesions might have been avoided by careful multidisciplinary team discussion of the core biopsies.

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Full field digital mammography: which equipment?

KC Young
National Coordinating Centre for the Physics of Mammography, Royal Surrey County Hospital, Guildford, UK
Breast Cancer Res 2008, **10(Suppl 3):**P33 (doi: 10.1186/bcr2031)

A wide variety of digital mammography systems are now commercially available. These include digital radiography (DR) systems such as the CSi/amorphous silicon detector (for example, GE Senographe 2000D, DS and Essential models), amorphous selenium (for example, LoRad Selenia, Siemens Novation and Inspiration models, IMS Giotto, Planmed Nuance) and a scanning system with silicon detectors (for example, Sectra Micro Dose Mammography). A variety of computerised radiography (CR) systems for mammography are also available (for example, Fuji Profect, Kodak DirectView, Konica

Regius 190, Agfa CR 85-X). Recently the CR manufacturers have introduced new designs of phosphor plates. Such a wide variety of systems raises the question of how the performances of these systems compare with each other and with film-screen technology. Another factor to be considered is the radiation dose required by each system to reach an acceptable level of image quality.

To help answer these questions, the National Health Service Breast Screening Programme and European Guidelines specify minimum and achievable standards for dose and image quality. The minimum standard is designed to ensure that new digital systems are at least as good as the previous film-screen systems. This lecture compares the measurements on a wide range of digital systems against the standards in the European Guidelines. The overall conclusion is that the DR systems can generally meet the achievable image quality standards for a dose lower than that used for film-screen systems. While the new designs of CR plate have brought about measurable improvements, most CR systems still require doses higher than film-screen systems to meet the minimum standards for image quality.

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Quality assurance of full field digital mammography

R van Engen

National Expert and Training Centre for Breast Cancer Screening (LRCB), Radboud University Nijmegen Medical Centre, Nijmegen, the Netherlands

Breast Cancer Res 2008, **10(Suppl 3):**P34 (doi: 10.1186/bcr2032)

Developments in digital mammography equipment have been very fast: the first digital mammography system was introduced in 1999, and new systems using different physical principles have since emerged and major improvements in equipment have occurred.

These improvements have solved some important quality issues that were present in some early digital mammography systems. However, image quality problems still occur relatively frequent and technical quality control is important to recognize and quantify them. Both the acceptance/6-monthly quality control tests and (at least) weekly quality control as recommended in the European Guidelines are therefore essential for high-quality mammography.

In the Dutch screening programme, technical quality control is performed against the Dutch Guidelines, which are very similar to the European Guidelines for Quality Assurance in Breast Cancer Screening and Diagnosis. However, some additional tests are performed: a more extensive noise evaluation and a more precise image quality evaluation. These might be included in an update of the European Guidelines.

In this presentation, some major failures, which have occurred recently, will be shown: significant additional noise (electronic and structural noise), disturbing artefacts, insufficient image quality, major ghosting, and so on.

Recently the European Reference Organisation for Quality Assured Breast Screening and Diagnostic Services (Euref) started a new project to update the European Guidelines, and is performing type testing in which it is determined whether a system is able to pass the Guidelines. When buying new mammography equipment, this type testing (by Euref) might be taken into account.

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Breast tomosynthesis in practice

I Andersson

Department of Diagnostic Radiology, University Hospital of Malmö MAS, Malmö, Sweden

Breast Cancer Res 2008, **10(Suppl 3):**P35 (doi: 10.1186/bcr2033)

One of the factors limiting the sensitivity of conventional mammography (analogue and digital) is the obscuring effect of dense breast tissue overlying and underlying a tumor. This problem should be reduced by a tomographic technique. Tomosynthesis implies acquiring multiple projection images over a certain angular range with mathematical reconstruction of slices parallel to the detector plane. This technique is made possible by the recent development of digital detectors with high efficiency, which are capable of acquiring low-dose images with fast read-out and minimal image lag.

Within our group, optimization studies of tomosynthesis have been performed regarding factors such as angular range, number of projection images, data collection mode, and so on.

Tomosynthesis has also been under clinical evaluation in our institution for about 2 years. We have analyzed a series of breast cancer patients selected on the basis of difficult two-dimensional mammograms, and graded the visibility of the malignancies on two-dimensional as well as on three-dimensional mammograms. Furthermore, we have classified the mammograms according to the BIRADS Breast Imaging Reporting and Data System.

The results have shown a significantly better visibility and more accurate BIRADS classification with tomosynthesis. Accordingly, the results suggest that tomosynthesis is a more sensitive technique for the detection of breast cancer than conventional digital mammography. Further studies of the sensitivity and specificity are underway.

We believe that tomosynthesis will play an important role in the detection and diagnosis of breast cancer in the future.

POSTER PRESENTATIONS

36

Accuracy of preoperative size prediction in infiltrating lobular carcinoma: comparison of mammography, ultrasound and clinical examination

F Canavan, B Atlas, A Sever, P Mills

Peggy Wood Breast Care Unit, Maidstone NHS Trust, Maidstone, UK

Breast Cancer Res 2008, **10(Suppl 3):**P36 (doi: 10.1186/bcr2034)

Objective Accurate preoperative size measurement of infiltrating lobular breast carcinoma (ILC) is of utmost importance in staging and prognosis. ILC is notoriously difficult to measure by conventional techniques, and surgical excision is often repeated for positive margins.

Method One hundred patients with biopsy-proven ILC underwent mammography, ultrasound (US) and clinical examination prior to surgery between 2000 and 2005. Correlation between histological and estimated size was determined. Insufficient funding prevented inclusion of magnetic resonance imaging (MRI) as a standard modality.

Results Over 50% had palpable lesions on examination ($n = 53$). The most frequent mammographic finding was a mass lesion ($n = 45$) without microcalcification ($n = 40$). Pearson correlation coefficients for each modality (mammogaphy, clinical, US) were similar ($r = 0.77$, $r = 0.76$, $r = 0.61$; $P < 0001$). Paired t tests demonstrated mean size differences of +1.31 mm (clinical, $n = 53$), −3.18 mm (mammography, $n = 70$) and −4.23 mm (US, $n = 89$).

Conclusion Correlations between estimated and actual tumour size for each modality (mammography > clinical > US) were similar. US and mammography underestimate size; clinical examinations overestimate it. Overall, conventional imaging is not

an accurate size predictor of ILC. Studies have shown superiority of MRI in size estimation of ILC. We recommend standard inclusion of preoperative MRI for ILC on this basis.

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Vacuum-assisted breast biopsy: comparison of three systems

F Canavan, AR Wilson, MJ Michell, D Evans, C Peacock, R Wasan, A O'Grady
King's Breast Radiology Unit, Kings College Hospital NHS Trust, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P37 (doi: 10.1186/bcr2035)

Background and objective Stereotactic and ultrasound-guided vacuum-assisted biopsy (VAB) has an important role in assessment of screen-detected lesions, particularly suspicious microcalcification. VAB technology has rapidly developed and three systems are now being evaluated at our institution; Suros (Suros Surgical Systems, Indianapolis, IN, USA), EnCore (SENORX, Columbia, USA) and Mammotome (Ethicon Endo-Surgery Inc., Cincinnati, OH, USA). Technical variations between these systems may impact on procedure effectiveness and patient experience. Our aim was to assess and compare these differences.
Methods A prospective study of 60 women undergoing image-guided VAB over 4 months was performed. Four experienced radiologists used each VAB system equally. Subjective operator experience and any technical or patient complication were recorded. A patient pain questionnaire with follow-up of haematoma formation was performed.
Results Subjective and objective parameters for the three VAB systems were tabulated, highlighting strength and weaknesses. The length of procedure varied according to the number of cores, clip placement and the particular system used. Postprocedural pain and haematoma formation also showed variation.
Conclusion The choice of VAB equipment is dependent on operator and patient experience but should not compromise diagnostic yield. Technical features of some VAB systems may improve effectiveness for particular lesions; awareness of these variations allows safer use.

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Columnar cell lesions with atypia: radiological features and surgical outcome

F Canavan, MJ Michell, N Dutt
King's Breast Radiology Unit, Kings College Hospital NHS Trust, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P38 (doi: 10.1186/bcr2036)

Background and objective Columnar cell change with atypia (CCCA) is increasingly diagnosed on core biopsy for indeterminate microcalcification, and may be associated with noninvasive ductal carcinoma *in situ* (DCIS) or invasive cancer. Few data exist on the risk of cancer in isolated CCCA lesions. We aimed to determine the rate of surgical upgrade to malignancy in CCCA and the predictive imaging features.
Methods A 5-year retrospective search of our database revealed CCCA as the primary finding in 21 cases of core biopsy. We reviewed mammographic features and surgical histology for each case.
Results All cases were screen-detected via indeterminate microcalcification on the mammogram; none had a palpable mass. Three patients declined surgery; 14 patients underwent diagnostic surgical excision and four patients had vacuum excision. Overall, 33% ($n = 6$) were upgraded to cancer; comprising low-grade DCIS ($n = 2$), invasive ductal carcinoma ($n = 2$), G1 tubular ($n = 1$) and G1 apocrine ($n = 1$). Of those surgically excised ($n = 14$), 43% were upgraded to cancer. Sixty-six per cent of cases ($n = 12$) revealed CCCA alone or with other benign changes. A microcalcification cluster size >10 mm appeared predictive for upgrade.
Conclusion CCCA presents as nonpalpable, clustered indeterminate microcalcifications on mammography. From this series, we recommend surgical excision for all cases where atypia is found with columnar cell change.

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Breast biopsy pathology request forms: are the radiologists completing them correctly and legibly?

L Neville[1], N Ridley[2], S Taylor[2], J Armstrong[1], J Cook[2]
[1]Pathology Department, Great Western Hospital, Swindon, UK; [2]Breast Screening Unit, Great Western Hospital, Swindon, UK
Breast Cancer Res 2008, **10(Suppl 3):**P39 (doi: 10.1186/bcr2037)

Introduction Radiologists rightly feel that imaging request forms should be completed correctly. Pathologists also require a minimum dataset to be completed on all histopathology requests. The breast screening radiologists and pathologists initiated an audit of wide-bore needle breast biopsy pathology request forms.
Standard One hundred per cent of pathology forms should be completed correctly and legibly.
Methods Forty breast wide-bore core biopsy pathology forms were reviewed. The principle data collected included patient demographics, clinical details and requesting doctor information. Forms were scored for legibility. Each item of data from each form was collected and compared against the standard.
Results The initial audit showed multiple minor deficiencies in form completion. Only 67.39% of total request details were completed correctly and 82% of request forms were easily legible. The radiologists did not appreciate the significance of a number of the pathology fields. These results were reviewed with the pathologists. Cross-checking by imaging assistants was introduced. A re-audit was performed, showing improvement; 84.9% of total request details were now completed correctly and all forms were legible.
Conclusion Correct completion of pathology forms is essential. Breast radiologists may not always appreciate all of the data required by their local pathologists.

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Breast screening assessment clinics: as easy as ABC

S Taylor, N Ridley, S Brown, N Gillhespy
Breast Screening Unit, Great Western Hospital, Swindon, UK
Breast Cancer Res 2008, **10(Suppl 3):**P40 (doi: 10.1186/bcr2038)

Introduction We have introduced a simple ABC classification system to streamline the patient pathway during the assessment clinic. Abnormalities are graded as A, B or C at consensus by the radiologists and reporting radiographers depending upon the mammographic likelihood of cancer and biopsy. This means that patients can be allocated to one of our three assessment clinics and at specific times within those clinics to facilitate workflow. This system has been in place for several years. Clinics have an average of eight patients and finish on time with minimal patient delay. We were interested to see how accurately our grading system correlated with final diagnosis, number of biopsies and additional films.
Methods We audited 30 assessments.

Results Films per patient: A, 0.7; B, 1.9; C, 2.2. Biopsy rate per patient: A, 0; B, 0.27; C, 0.7. Cancer diagnosis per patient: A, 0; B, 0.18; C, 0.44.
Conclusion The results confirm that our grading system correlates with final diagnosis, the number of films and the biopsy rate. The planned extension of the breast screening programme will further increase workload in the assessment clinics. A simple ABC grading method can be introduced easily within the screening programme to improve assessment clinic efficiency.

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Can computed tomography replace nuclear medicine scans in the staging of breast cancer?

N Ridley, S Taylor, R Young
Breast Screening Unit, Great Western Hospital, Swindon, UK
Breast Cancer Res 2008, **10(Suppl 3):**P41 (doi: 10.1186/bcr2039)

Introduction Selected patients with breast cancer are staged using computed tomography (CT). CT demonstrates disease in the lungs, liver, lymph nodes and bones. Traditionally, isotope bone scanning (NM) is used to stage the skeleton. If bony pathology is imaged as well on CT as on NM, it may be possible to dispense with the bone scan.
Methods Breast cancer patients who had CT and bone scanning within 1 month of each other were reviewed retrospectively to correlate the pathology.
Results Out of 44 combined scans, 12 were normal on both investigations. Seventeen CT scans had normal bones but demonstrated extraskeletal pathology. On seven CT scans, the bony metastases were better visualised than on NM. Five bone scans showed abnormalities outside the CT scan field (humerii and femora) but only one of these was a solitary abnormality. Five hotspots on NM were confirmed as a degenerative change on CT.
Conclusion CT is as sensitive as NM and is more specific, with the exception of those areas not included on the scan; however, these areas could be included on the CT scan. CT will show additional pathology. Bone scanning may not be needed when patients have had a CT scan.

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Audit of a radiographer/nurse-led family history breast cancer clinic

SA Willson, R Edwards, J Reeves, PA Middleton, AM Klidjian
Breast Care Centre, Taunton and Somerset NHS Foundation Trust, Taunton, UK
Breast Cancer Res 2008, **10(Suppl 3):**P42 (doi: 10.1186/bcr2040)

Following the publication of National Institute of Clinical Excellence (NICE) guidelines for familial breast cancer [1], we implemented nurse-led and radiographer-led family history clinics. These replaced a formerly *ad hoc* system of general practitioner mammogram requests and referrals to the surgical breast clinic.
At the clinic, women were assessed as to their level of increased risk of breast cancer by a detailed family history. They were taught breast self-examination and were put onto appropriate mammography surveillance when indicated or were reassured and discharged.
The majority of referrals were from general practitioners – 62% of women were found to be in the high (23%) and moderate (39%) risk categories. Thirty-eight per cent of patients were found to be at population risk (24%) or were inappropriate referrals.
In conclusion: (1) nurse/radiographer-led family history clinics are effective and an efficient use of resources; (2) there is a high degree of client satisfaction; and (3) there are a significant number of referrals that were not indicated according to NICE guidelines, and action is required to address this issue.

Reference

1. *NICE Guideline CG41: The Classification and Care of Women at Risk of Familial Breast Cancer in Primary, Secondary and Tertiary Care.* NHS National Institute for Health and Clinical Excellence; 2006.

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Breast cancer in young identical twins

SA Willson, PA Middleton
Breast Care Centre, Taunton and Somerset NHS Foundation Trust, Taunton, UK
Breast Cancer Res 2008, **10(Suppl 3):**P43 (doi: 10.1186/bcr2041)

A 25 year old presented with a 12-week history of a mobile breast lump. Mammography and breast ultrasound demonstrated a 3 cm mass lesion, extensive microcalcification and axillary lymphadenopathy. Core biopsies confirmed a grade 3 ductal carcinoma and high-grade ductal carcinoma *in situ*.
Several weeks later her identical twin sister attended the family history breast cancer clinic. Clinical breast examination was normal but, despite the patient's age, it was decided to carry out a baseline mammogram. This showed widespread casting microcalcification, and core biopsies confirmed extensive high-grade ductal carcinoma *in situ*.
When one twin has breast cancer, one-third of identical twins develop breast cancer at some time in their lives. Nonidentical twins of breast cancer patients have a much smaller risk of the disease. This suggests identical twins gain their increased risk by inheriting the same set of genes as their sister with cancer, rather than through sharing the womb or being brought up together. Where one twin develops breast cancer at an early age, the other has a high chance of doing likewise.

Reference

1. Peto J, Mack TM: **High constant incidence in twins and other relatives of women with breast cancer.** *Nat Genet* 2000, **26:**411-414.

44

A practical perspective of computerised radiography on a mobile screening van

A Turnbull, B Young, K Hayer, J Bacon, J York, S Farmer
Derby Breast Unit, Derby City Hospital, Derby, UK
Breast Cancer Res 2008, **10(Suppl 3):**P44 (doi: 10.1186/bcr2042)

Prohibitive costs of implementing direct digital mammography throughout our unit, as we would need to replace analogue machines on two mobile screening vans and at one satellite static unit, directed us towards the interim solution of computerised radiography (CR).
An agreement was made between ourselves and Fuji to pilot the use of CR on a mobile screening van.
We looked at the practicalities of installation of equipment, training and changes to working practices for radiographers, film-reader comparison of images and technical recall rates.
The pilot has been in place for 1 year; 720 independent observations have been made by one consultant radiologist and three mammographic film-readers, comparing hardcopy CR images with previous analogue films, using the criteria set out in the National Health Service Breast Screening Programme evaluation of digital equipment document.

The results demonstrate that CR printed films are at least as good as analogue films, and in many cases better. The spread of relative diagnostic value was between –1 (0.4%) and +2 (14.4%) in favour of CR. This was most marked in the dense breast patterns, as shown in previous publications.
Aspects of physics testing will also be discussed.

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Comparison between the NVQ Level 3 in Diagnostic and Therapeutic Care and the BTec Professional Development Certificate for assistant practitioners in imaging: the Derby experience

M Cross, R Riley, T Bluck, D Samra
Derby Breast Unit, Derby City Hospital, Derby, UK
Breast Cancer Res 2008, **10(Suppl 3):**P45 (doi: 10.1186/bcr2043)

The poster looks at two different learning pathways for training assistant practitioners in mammography. Four assistant practitioners were trained: two practitioners using the NVQ Level 3 in Diagnostic and Therapeutic Care, delivered and supported by the local Hospital Trust; and two practitioners doing the BTec Professional Development Certificate at Derby University. Comparisons are made between both courses with regard to timescales and academic content, and how these can be linked to further professional development. Advantages and disadvantages of both courses are discussed.

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The seated mammographer: a radical improvement in ergonomics

JR Lavell, J Burkitt
University Hospital Birmingham, West Midlands, UK
Breast Cancer Res 2008, **10(Suppl 3):**P46 (doi: 10.1186/bcr2044)

Anecdotally there are many mammographers that experience musculoskeletal discomfort, although it does not feature highly in the published literature. The aim of the present project was to reduce musculoskeletal discomfort and pain associated with mammography, through examining ways of improving posture and thereby reducing muscular loading.
The poster demonstrates how we evaluated our working practice with the support of ergonomic professionals, in order to reduce high-risk techniques and postures. Our evaluation led to a radical change in the way our mammographers undertake the examination. The present project has demonstrated the importance of examining our own working practice, seeking informed professional advice and being willing to change or adapt our techniques to minimize long-term health implications.

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Only skin deep: a pictorial review of skin and subcutaneous lesions

P Moyle, M Hunt, P Britton
Cambridge Breast Unit, Addenbrooke's Hospital, Cambridge, UK
Breast Cancer Res 2008, **10(Suppl 3):**P47 (doi: 10.1186/bcr2045)

Many skin and subcutaneous lesions can be demonstrated on screening mammograms, and may mimic malignancy. Careful clinical history and meticulous annotation is paramount to avoid pitfalls in mammographic interpretation, inappropriate recall and further evaluation. The National Health Service Breast Screening Programme [1] states that radiographers should note on the screening sheet any significant or relevant symptoms reported by the women or observed during the examination.
We shall illustrate 20 examples of radiographer-annotated lesions and correlate them with their corresponding mammograms and ultrasounds. Examples include sebaceous glands, seborrhoeic keratosis, skin tags, dimples from underlying malignancy, surgical scars, artefacts mimicking microcalcification, distended veins of Mondor's disease, central venous thrombosis, iliac vein thrombosis as well as peau d'orange.
Correct annotation can help to avoid misdiagnosis, unnecessary recall, anxiety and further investigations. The importance of meticulous radiographer annotation is emphasized.

Reference

1. NHSBSP National Quality Assurance Coordinating Group for Radiography: **Information and Advice for Health Care Professionals in Breast Screening.** NHSBSP Publication No. 53, section 8.1. December 2002.

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Interval cancer data collection within the South West Quality Assurance Reference Centre

E Kutt[1,2], F Johnson[1], D Harker[1]
[1]South West Region Breast Screening Quality Assurance Reference Centre, Bristol, UK; [2]Avon Breast Screening Unit, Bristol, UK
Breast Cancer Res 2008, **10(Suppl 3):**P48 (doi: 10.1186/bcr2046)

Interval cancers are an important measure of screening quality and, although they are an expected and inevitable part of any cancer screening process, their numbers should be kept as low as possible. Interval breast cancer cases may be identified from a number of sources, including symptomatic clinics, pathology laboratories and cancer registries.
The South West Quality Assurance Reference Centre (QARC) has developed a database to assist in the collection and validation of interval cancer data. The database has been developed collaboratively with the South West Cancer Registry, which sits within the South West Public Health Organisation (SWPHO). Service-level agreements are in place between the QARC and the nine Trusts hosting the Breast Screening Units and with the SWPHO.
The present poster details the information flows between the breast screening units in the South West, QARC and the SWPHO by comparing and contrasting viable data items. The system not only identifies potential interval cancers but will also aid validation and verification of cancer data held by the SWPHO. Validated data will be fed back to the screening units.

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Abstract withdrawn

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Metastases to the breast

J Arora[1], C Betancourt[2], D Dalgliesh[2], D Goddard[2]
[1]Bristol Royal Infirmary, Bristol, UK; [2]Royal United Hospital, Bath, UK
Breast Cancer Res 2008, **10(Suppl 3):**P50 (doi: 10.1186/bcr2048)

Introduction Metastases to the breast (MB) account for 0.5% to 6.6% of breast malignancies. Diagnosis is difficult because of nonspecific clinical, radiological and histological manifestations. To plan appropriate management, it is important to differentiate MB from primary breast malignancy (PBM).

Objective To review the clinical and imaging presentation of MB and to differentiate these from PBM.
Method We retrospectively identified over a 15-month period six pathologically proven cases of MB from an extramammary malignancy. The clinical, ultrasound and mammographic presentations are tabulated. These are compared with the features of PBM.
Results Primary tumours included one melanoma, two lung cancers, one lymphoma, one gynaecological malignancy and one unknown primary. The MB was the presenting feature in four out of six cases. Five patients had both mammogram and ultrasound examinations, and one of these had breast MRI in addition; one patient had ultrasound only. Imaging features were similar to those discussed in the literature and include well-defined nodules, associated axillary lymphadenopathy and an absence of distortion or microcalcifications.
Conclusion Although radiological appearances may be helpful, MB must be differentiated from PBM by appropriate histopathologic examination, in order to preclude unnecessary mastectomy and to guide further management.

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Predicting the presence of invasive carcinoma from the extent of mammographic malignant microcalcification and grade of ductal carcinoma *in situ* on core biopsy: results from a National Health Service Screening Programme

EAM O'Flynn[1], JC Morel[1], J Gonzalez[2], H Purushothaman[1], D Evans[1], R Wasan[1], MJ Michell[1]
[1]South East London Breast Screening Programme and National Breast Screening Training Centre, King's College Hospital NHS Foundation Trust, London, UK; [2]Department of Clinical Research Statistics, King's College Hospital NHS Foundation Trust, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P51 (doi: 10.1186/bcr2049)

Four hundred and two cases of malignant microcalcification presenting through a National Health Service screening programme over a 10-year period were analysed. The final histological diagnosis was ductal carcinoma *in situ* (DCIS) only in 71% (284/402 cases) and DCIS with a focus of invasive disease in 29% (118/402 cases).
There were significant associations with the presence of invasive disease for the histological grade of DCIS ($\chi^2 = 9.06$, $P = 0.003$) and for the cluster size ($\chi^2 = 12.18$, $P = 0.0001$). The proportion of cases with invasive tumour increased with increasing DCIS grade, from 13% (4/31) for low-grade DCIS to 36% (86/239) for high-grade DCIS; increasing cluster size, from 20% (27/136) <11 mm to 45% (18/40) >60 mm; and with increasing DCIS grade within each microcalcification cluster size category: <11 mm from 13% to 25%, 11 mm to 30 mm from 13% to 36%, 31 mm to 60 mm from 0% to 41%, and >60 mm from 25% to 55% for low-grade to high-grade DCIS, respectively.
The Hosmer–Lemeshow goodness-of-fit test supports this model ($\chi^2 = 0.59$, $P = 0.96$). The multidisciplinary team can use these data to estimate the risk of invasive cancer and to formulate appropriate management to minimise the number of patients requiring more than one operation, currently 49% for those with DCIS on core biopsy in a screening population [1].

Reference

1. **UK NHS Breast Screening Programme Statistics 2005-2006** [http://www.cancerscreening.nhs.uk/breastscreen/statistics.html]

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HILINA: minimising the breast compression time at stereoguided biopsy

GP Naisby[1], H Harris[1], K Robson[2]
[1]James Cook University Hospital, Middlesbrough, UK; [2]Regional Medical Physics Department, Newcastle General Hospital, Newcastle upon Tyne, UK
Breast Cancer Res 2008, **10(Suppl 3):**P52 (doi: 10.1186/bcr2050)

With mammography alone it is often difficult to distinguish between benign and malignant microcalcifications in the breast, and image-guided biopsy is widely undertaken for clarification.
National Health Service Breast Screening Guidelines recommend that representative microcalcifications must be demonstrated in core specimens on specimen radiography: to achieve high absolute sensitivity for malignancy, at least five flecks of calcium in three cores are required [1].
An innovative device (HILINA), which was designed and developed locally, fits onto the tube housing of the Novation/Nova with Opdima digital stereo biopsy unit (Seimens Corporation, Camberley, UK), and allows direct digital capture of core biopsy images during breast compression. This shortens the breast compression time and allows rapid termination of the biopsy procedure.
Analysis of the visibility of microcalcifications in core biopsy specimens from 20 consecutive patients has demonstrated that this is a satisfactory, cost-effective method of documenting adequate sampling when compared with cabinet computed radiography.

Reference

1. Wilson R, Liston J: *Clinical Guidelines for Breast Cancer Screening Assessment, NHS Breast Screening Programme*. NHSBSP Publication No 49. 2nd edition. Sheffield: NHS Cancer Screening Programmes; January 2005:11-16. [http://www.cancerscreening.nhs.uk/breastscreen/publications/nhsbsp49se.pdf]

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Consensus approach to discrepancies arising from independent double reading of screening mammograms

R Hiscock, G Hurst
Norfolk and Norwich University Hospital, Norwich, UK
Breast Cancer Res 2008, **10(Suppl 3):**P53 (doi: 10.1186/bcr2051)

Objective To establish whether the consensus approach is a reliable method for review of discordant results of double-reported mammograms undertaken through the National Breast Screening Programme at the Norfolk and Norwich University Hospital.
Method Analysis of a comprehensive database already held of all cancers detected between screening rounds enabled identification of all cancer cases that went through the consensus process and were considered normal. These cases were reviewed to ascertain whether the radiological appearance considered at consensus was actually the site of the subsequently diagnosed cancer.
Results Over the 6 years of the study three false negative outcomes were identified from 2,264 cases returned to the normal screening round from the consensus process. Out of 1,942 cases that proceeded to assessment through the consensus process, however, 161 cancers were detected, of which 112 had an invasive component. Eighty-three of these cancers were 15 mm or less in size. This left 49 noninvasive (ductal carcinoma *in situ*) cases, of which 31 were high-grade ductal carcinoma *in situ*.
Conclusion These findings illustrate the success of the consensus approach to discordance in screen reading. A combination of two-

view mammography and independent double reading has seen an increase in cancer detection.

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Evidence to support the use of ultrasound in addition to mammography as part of breast cancer follow-up surveillance

SN Andrews, DJ Ferguson, JM Dunn, RR Davies, MJ Cooper
Department of Breast Surgery, Royal Devon & Exeter Hospital, Exeter, UK
Breast Cancer Res 2008, **10(Suppl 3):**P54 (doi: 10.1186/bcr2052)

Introduction Following breast cancer treatment, our unit has routinely offered ultrasound in conjunction with mammography as part of radiological follow-up surveillance. The primary objective was to assess the value of ultrasound as an adjunct to mammography in surveillance detection of local/nodal recurrent disease.
Methods A retrospective analysis of all breast cancer patients with recurrence who had completed 5 years of follow-up was performed. The site of recurrence was noted (local and/or nodal) and the method of detection was also recorded. The recurrences primarily detected as a result of radiological surveillance invite were investigated and noted to be apparent by mammogram exclusively, apparent by ultrasound exclusively or apparent by both modalities.
Results During the 8-year study period, 2,580 patients were treated surgically and completed follow-up; 116 recurrences were detected (4.5%). From the 116 patients the total number of recurrences detected purely as a result of radiological surveillance invite was 43% ($n = 50$). Of those, 22% ($n = 11$) were ultrasound detectable only. The primary method of detection was very different depending on the site of recurrence.
Conclusion Ultrasound does have value in radiological breast cancer follow-up as an adjunct to mammography, being the primary and exclusive detection tool in 1/5 of radiologically detected cases overall. Ultrasound surveillance has primarily detected 25% of nodal recurrence that otherwise would have lead to delayed diagnosis.

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Abstract withdrawn

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The developing role of mammographers in performing sentinel node injections in a specialist breast care centre

A Kelly, AM Kelly, J Kopman
Nightingale Centre and Genesis Prevention Centre, Manchester, UK
Breast Cancer Res 2008, **10(Suppl 3):**P56 (doi: 10.1186/bcr2054)

The purpose of the present poster is to highlight the efficiency and cost-effectiveness of a mammographer-led sentinel node injection session within a specialist breast care centre. The axillary lymph node status provides the most important staging information and offers improved regional control. Sentinel lymph node biopsy has been reported as providing a safe and sensitive method of predicting axillary metastases and can help prevent unnecessary axillary surgery in a number of breast cancer patients [1]. Sentinel node injections have developed into a significant aspect of the mammographer's role expansion and have become fundamental in a specialised breast care centre. Utilisation of mammographer's skills in an extended role has increased motivation and job satisfaction and has provided career enhancement. Mammographer-led sentinel node injection sessions have reduced the inpatient stay, improved the patient's journey and reduced the dose of radioisotope given to the patient.

Reference

1. Giuliano AE, Dale PS, Turner RR, Morton DL, Evans SW, Krasne DL: **Improved axillary staging of breast cancer with sentinel lymphadenopathy.** *Ann Surg* 1995, **222:**394-401.

57

Large-volume Mammotome biopsy may reduce the need for surgery in screen-detected papillary lesions

PJ Carder[1], P Burrows[2], ST Dennis[2], N Sharma[2]
[1]Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK; [2]Pennine Breast Screening Service, St Lukes Hospital, Bradford, UK
Breast Cancer Res 2008, **10(Suppl 3):**P57 (doi: 10.1186/bcr2055)

The majority of papillary breast lesions diagnosed on conventional needle-core biopsy are classified B3 – of uncertain malignant potential. There is currently debate whether such lesions require surgical excision, particularly if there is no epithelial atypia. The risk of associated malignancy is low.
Large-volume Mammotome (Ethicon Endo-Surgery, Cincinnati, OH, USA) biopsy can sample lesions more extensively, obviating the need for surgery in some cases. We review the impact of adopting this approach for the management of screen-detected B3 papillary lesions without atypia.
Fifteen patients presenting through the Pennine Breast Screening Programme between 19 December 2005 and 23 August 2007 had core biopsies containing a B3 papillary lesion without atypia. Mammographically, 12 patients had calcification and three presented masses. Three patients underwent surgical excision, 10 underwent Mammotome biopsy and two patients had no subsequent procedure.
All three patients undergoing surgery showed benign intraductal papillomata. Of the 10 patients undergoing Mammotome, eight were confirmed as benign. None subsequently developed malignancy. One Mammotome patient contained ductal carcinoma *in situ* (DCIS); another, an atypical epithelial proliferation resulting in surgery and a subsequent diagnosis of DCIS. Both cases were distinctive in presenting with segmental calcification, and in both DCIS had arisen in the context of multiple papillomata.
Large-volume Mammotome biopsy may reduce the need for surgery in selected screen-detected papillary lesions.

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Significance of new benign densities seen on screening mammograms of women older than 60 years of age

C Bradley, A Rahman, A Hubbard
Castle Hill Hospital, Cottingham, UK
Breast Cancer Res 2008, **10(Suppl 3):**P58 (doi: 10.1186/bcr2056)

Breast cancer risk is strongly related to age, with 80% of cases occurring in women over 50 years old. Small, benign-looking lesions in perimenopausal women have a very low risk of malignancy and are not recalled. We undertook an audit to assess the significance of a single, new, apparently benign (R2) lesion seen on both views on screening mammograms of women aged 60 years and above. Any new density with suspicious imaging was recalled without being entered into the audit.
A total of 70 women were included. Fifty-seven patients had no significant findings or cysts on ultrasound, with a normal

postaspiration mammogram. Three patients had cyst aspirate sent for cytology, and one of these went on to have a core biopsy for a C3 result. Ten patients had a solid lesion on ultrasound warranting a core biopsy, two of which had a B5 lesion.
Although the majority of patients had a benign result, a total of three out of 70 patients had an abnormal cytology/histology. We recommend that new benign densities seen on two views in women aged over 60 years old are fully assessed and biopsied to determine their nature.

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Abstract withdrawn

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Digital breast screening: does it do what it says on the tin?

A Teape, A Connors, P Mclarnon
BreastCheck Southern Unit, Cork, Ireland
Breast Cancer Res 2008, **10(Suppl 3):**P60 (doi: 10.1186/bcr2058)

Introduction Screening women in the Southern Region of Ireland commenced in December 2007. Prior to this, screening was only available in the eastern regions and the two units in this region had a mix of analogue and digital equipment.
Background Although the BreastCheck Southern Unit is working with digital systems, our clinicians have come from an analogue background. Practice shows that, despite manufacturers' claims on the reduced need for certain imaging at assessment, this is not happening in reality. Historically, women recalled to assessment had a number of further views, ultrasound and, in some instances, a biopsy performed. The average time spent in the clinic for each woman was 2 hours. As this unit is digital and has only commenced its service, an audit was commissioned.
Methods The audit will include data for a 4-month period from January 2008, involving all women recalled to assessment. The following will be evaluated: compression used at initial screen and whether low levels of compression increase the recall rate; further imaging and whether these images add any new information to aid diagnosis, especially with the advances in digital imaging; and streamlining the clinics to provide a more efficient service for our clients.

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Derby results and practical experience of breast imaging in women following supradiaphragmatic irradiation for Hodgkin's disease

AE Turnbull[1], M Bagnall[1], S Puri[1], M Persic[2]
[1]Breast Unit, Derby City Hospital, Derby, UK; [2]Department of Oncology, Derby Royal Infirmary, Derby, UK
Breast Cancer Res 2008, **10(Suppl 3):**P61 (doi: 10.1186/bcr2059)

The national recall programme for women who had supradiaphragmatic irradiation for Hodgkin's disease under the age of 30 years began in late 2003. In Derby, from an initial identified group of 56 women, 36 attended for a 1-hour consultation with a consultant oncologist. From these 36 women, 33 have attended for surveillance.
In the group offered imaging surveillance, all 33 women took up the invitation. When magnetic resonance imaging (MRI) is indicated, it is done first; then the woman attends for mammography, MRI results and any focused ultrasound needed the following day.

Table 1 (abstract P61)

Year	2004	2005	2006	2007
Number of mammograms	21	16	18	19
Number of MRI scans	1	10	11	12
MRI recalls	0	6	0	0
Cancer diagnosed	0	1	0	0

See Table 1 for results. Five of the six MRI recalls were from a first screen, and the other from a second screen. One ductal carcinoma *in situ* was diagnosed in a lady with breast implants.
From the 56 eligible women, there were four with breast cancer: one woman diagnosed as above, two women from the National Health Service Breast Screening Programme and one woman symptomatically in 2007. The radiology and pathology of these cases will be presented.
We commence family history screening with MRI soon and plan to apply this method, which works very well and within tight time limits.

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Maximising round length in a large National Health Service breast screening unit

BA Eckersley, S Berry, R Robertson
Nightingale Centre and Genesis Prevention Centre, Manchester, UK
Breast Cancer Res 2008, **10(Suppl 3):**P62 (doi: 10.1186/bcr2060)

Within the National Standards for Breast Screening is the objective to ensure that women are recalled for screening at appropriate intervals.
The Manchester Breast Screening Unit has utilised the ability to specify batches from the health authorities in a specific order, to maximise the call and recall system for women eligible for primary screening.
The minimum standard for the criterion of the percentage of eligible women whose first offered appointment is within 36 months of their previous screen is ≥90%. Using the computer program has maximised the appointment scheduling, but in addition has derived benefits to the Commissioning Primary Care Trusts. The appointment timescales, offering women screening on mobile vans, has enabled the Primary Care Trusts the opportunity to promote breast screening effectively to the eligible women who have failed to attend their first appointment. In low-uptake areas, this has facilitated the efforts to increase uptake to the national standard of 70%.

Reference

1. *Quality Assurance Guidelines for Administrative and Clerical Staff.* NHSBSP Publication 47. Sheffield: NHS Breast Screening Programme; 2000.

63

Radial scars: to excise or not to excise?

A Moorhead, JE Murray, AM Gilchrist
South East Scotland Breast Screening Programme, Edinburgh, UK
Breast Cancer Res 2008, **10(Suppl 3):**P63 (doi: 10.1186/bcr2061)

Radial scars present a difficult problem within breast screening. A proportion contains a spectrum of pathological change, including invasive cancer [1]. For this reason, surgical excision has been recommended [1]. With increasing use of vacuum-assisted biopsy, recommendations are now in place to allow leaving these lesions without excision where no atypia is identified [2].

We present our series of 100 B3 radial scars consecutively diagnosed by 14-gauge core biopsy between 2004 and 2007. This includes 13 malignancies subsequently identified on surgical excision. Five were invasive (size, 2 mm to 11 mm), and eight were ductal carcinoma *in situ* (size, 3 mm to 22 mm). In three cases of invasive cancer <10 mm, no concomitant atypia was identified. In these cases, had vacuum-assisted biopsy not included the small invasive area, surgical excision would not have been recommended under current guidelines. Hence, the cancers would have remained undetected.

This information will continue to inform the debate surrounding surgical excision versus vacuum-assisted biopsy without excision in the management of radial scars.

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2. **Clinical guidelines for breast cancer screening assessment.** 2nd edition. Unpublished work. January 2005.

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Infection control in the mammography units of New South Wales, Australia and the Republic of Ireland

D O'Leary[1], J McCrann[1], A Poulos[2], S Lewis[2]
[1]University College Dublin, Ireland; [2]University of Sydney, New South Wales, Australia
Breast Cancer Res 2008, **10(Suppl 3):**P64 (doi: 10.1186/bcr2062)

Background The goal of this research collaboration was to establish whether mammography units within New South Wales, Australia (NSW) and the Republic of Ireland (ROI) have dedicated mammography-specific infection control protocols and the extent of cleaning/disinfection of these units. Possible vectors for increased bio-load on hospitals/outpatient facilities specifically due to these mammography units were also examined. During mammography, patients' friable skin is in close contact with equipment/hands; possibility of infection spread is highest where immunity has been lowered by the disease process.

Method A questionnaire underpinned by worldwide infection control guidelines was formulated and circulated to radiographers in symptomatic/asymptomatic mammography units within the ROI and NSW.

Results Whilst mammography-specific infection control protocols were available in fewer ROI units (25%) than NSW units (32%), NSW mammographers (43%) had less access to documented protocols (versus 94% for ROI units). Significant variation in cleaning methods, consistency and procedures was observed in both regions. Infection control is not routinely included in the quality assurance process of all units.

Conclusion Many aspects of infection control procedures are less than satisfactory. These procedures should be regulated with specific mammography infection control protocols within the quality assurance process to prevent patient cross-infection, with a consequent lowering of biological burden on hospital/outpatient facilities.

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Additional application of ^{1}H-spectroscopic (3D-MRSI) and diffusion-weighted magnetic resonance imaging (MRI) in breast MRI at 3 T: is there a diagnostic value in comparison with high temporal and spatial resolution morphologic and dynamic MRI in patients with breast lesions?

K Pinker[1], S Gruber[1], W Bogner[1], G Grabner[1], P Szomolanyi[2], T Helbich[3], G Heinz-Peer[4], S Trattnig[1]
[1]MR Centre of Excellence, Department of Radiology, Medical University Vienna, Austria; [2]Department of Imaging Methods, Institute of Measurement Science, Slovak Academy of Sciences, Bratislava, Slovakia; [3]Department of Medical Imaging, University of Toronto, Canada; [4]Department of Radiology, Medical University Vienna, Austria
Breast Cancer Res 2008, **10(Suppl 3):**P65 (doi: 10.1186/bcr2063)

Introduction To assess the diagnostic accuracy of ^{1}H-spectroscopic (3D-MRSI) and diffusion-weighted magnetic resonance imaging (DWI) in comparison with high-temporal and spatial resolution dynamic MRI in patients with breast lesions at 3 T.

Materials and methods Thirty-six patients were examined on a 3 T system. The MRI protocol included: contrast-enhanced (CE) coronal volumetric interpolated breathhold examination with high-temporal resolution (isotropic 1.7 mm, time of acquisition (TA) 11.7 seconds, 17 measurements); coronal magnetization prepared rapid gradient echo at expected maximum CE (1 mm isotropic, TA 2.03 minutes), repeated coronal volumetric interpolated breathhold examination, diffusion-weighted imaging using a twice-refocused singleshot echo planar imaging sequence with inversion recovery fat-saturation employing four *b* values (TA 4.48 minutes), 3D-MRSI (10 x 10 x 10 mm^{3}; TA 11 minutes). The lesion morphology and CE kinetics were assessed. Regions of interest for suspicious areas were evaluated for elevated choline levels and decreased apparent diffusion coefficient values as a marker of malignancy.

Results Sixty-five lesions were detected in 36 patients. CE-MRI determined 11 lesions, DWI 11 lesions and 3D-MRSI 11 lesions (one false positive, one false negative) as malignant. CE-MRI determined 48 lesions, DWI 54 lesions and 3D-MRSI 49 lesions as benign. 3D-MRSI was not applicable in five prepectoral lesions. CE-MRI determined six lesions as indifferent, which were benign with DWI and 3D-MRSI.

Conclusion The performance of dynamic MRI and additional DWI and 3D-MRSI is possible within reasonable scan time, and additional DWI and 3D-MRSI aid the differentiation of breast lesions with indifferent morphology and/or CE kinetics.

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Study of the availability of digital mammography for premenopausal women in the Valencian Breast Cancer Early Detection Program

M Ramos[1], R Tortosa[2], V Gonzalez[2], G Verdú[1], JI Villaescusa[2]
[1]Chemical and Nuclear Engineering Department, Polytechnic University of Valencia, Spain; [2]Radiation Protection Service, La Fe University Hospital, Valencia, Spain
Breast Cancer Res 2008, **10(Suppl 3):**P66 (doi: 10.1186/bcr2064)

In 1992, the Valencian Breast Cancer Screening Program (VBCSP) started in the Valencian Community. To date, 24 mammography units have been installed all over the region. There is a health risk in the studied women that has to be estimated and controlled. A methodology to calculate approximately the radiological detriment in the VBCSP has been developed based on

Monte Carlo techniques. As qualitative parameters in the program, the average mean glandular doses from representative sample populations undergoing screening mammography (digital or film) from each of the 24 units in operation have been obtained. The American College of Radiology Imaging Network reached the conclusion that digital mammography performed significantly better than film for premenopausal and perimenopausal women younger than 50 years old [1]. Our group uses the software SCREENRISK [2] to estimate the induction/detection rates in order to corroborate American conclusions in a European region. The obtained results confirm the American results about the application of digital mammography in premenopausal and perimenopausal women younger than 50 years old.

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The West Midlands screening histories results

K Martin, E O'Sullivan, O Kearins, G Lawrence
West Midlands Cancer Intelligence Unit, Birmingham, UK
Breast Cancer Res 2008, **10(Suppl 3):**P67 (doi: 10.1186/bcr2065)

Utilising cancer registration and screening data, every primary breast cancer case diagnosed in women eligible for screening in the West Midlands since screening began until March 2006 was assigned a screening status based on the woman's screening history. Tumours were allocated to one of eight screening status categories [1]. The 10-year relative survival was calculated for the five main categories.

A total of 24,095 cancers were classified (Table 1). Of these, 27% were classified as interval cancers, and the incidence rates of these cases were lower for the 25-month to 36-month period from screening to diagnosis compared with the 0-month to 24-month period. Of these interval cancers, 62% were diagnosed in women who had been screened more than once. In the most affluent women, 30% were interval cancers and 7% were non-attenders. In the most deprived women, 21% were interval cancers and 15% were non-attenders.

Women with screen-detected breast cancer had the best survival rates; women with interval cancers had survival rates above those of non-attenders, highlighting the benefits of screening.

Reference

1. Lawrence G, Kearins O, O'Sullivan E, Tappenden N, Wallis M, Walton J: **The West Midlands breast cancer screening status algorithm – methodology and use as an audit tool.** *J Med Screen* 2005, **12:**179-184.

Table 1 (abstract P67)

Screening status	Proportion (%)	10-year relative survival rate (%)
Screen-detected	44	92.25
Interval	27	75.65
Diagnosed before invitation	12	68.81
Non-attender	9	53.95
Lapsed attender	4	72.15

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An audit reviewing the management of fibroadenomas with the advent of Mammotome in the breast unit in Bradford

ST Dennis, P Carder, P Burrows, N Sharma
Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK
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Fibroadenomas are the commonest benign breast tumours. Prior to vacuum-assisted large-volume biopsy, surgical excision was the only therapeutic option available. Our unit introduced Mammotome (Ethicon Endo-Surgery, Cincinnati, OH, USA) in January 2006, with Mammotome excision offered from September 2006 (for lesions 25 mm or less). We reviewed the change in practice with the advent of Mammotome.

Patients with histological diagnosis of fibroadenoma throughout 2006 and 2007 were identified. The radiology and histology were reviewed.

A total of 355 fibroadenomas were diagnosed in 333 patients: 252 presented symptomatically, 81 were screen-detected.

Thirty-five diagnostic Mammotomes were performed (33 had been nondiagnostic on needle-core biopsy, two had radiology/pathology discordance). Definitive diagnosis was consequently made in 34 cases. One patient with nondiagnostic Mammotome had subsequent surgical biopsy of benign fibroadenoma.

Seventy patients underwent excision. Fifteen were ultrasound Mammotome excisions; 13 confirmed fibroadenoma and two were phylloides (having surgical cavity excision subsequently). Fifty-five were surgical excisions; 33 were either unsuitable for Mammotome excision or the patient chose surgery; 11 were B2/B3 lesions and pathology recommended surgical excision; and the remaining 11 were before the introduction of Mammotome excision.

Mammotome offers patient choice regarding excision of fibroadenomas, and reduces the number of surgical biopsies.

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Variations in excision biopsy rates for women with B3/C3 results do not account for high benign open biopsy rates in the NHS Breast Screening Programme: a regional study

RM Watkins, F Johnson, A Mayer, A Bennett, DJ Harker, D Parham
South West Region NHSBSP QA Reference Centre, Bristol, UK
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Introduction Since 2000 the South West Region has shown a benign open biopsy rate higher than the national average, often failing to meet the guideline targets.

Methods Information from the nine screening units in the South West Region of all women having a B3 or C3 diagnosis as their final result following screening assessment during the period 2003 to 2005 was reviewed.

Results Of 374 women with a B3/C3 result, 89 (23%) had no further investigations. Between individual units, the proportion of women undergoing surgical biopsy ranged from 55% (18/33) (95% CI = 37% to 71%) to 89% (72/81) (95% CI = 80% to 94%). Of 285 women undergoing open biopsy, 75 (26%) had malignant disease. The range between units was 13% (5/38) to 36% (26/81). There was no correlation between the rate of open

biopsy for B3/C3 lesions and the overall benign biopsy rates, which ranged from 0.76 to 2.74 per 1,000 women screened.
Conclusion B3/C3 results following screening assessment are associated with a significant risk of malignancy. Variations in rates of surgical biopsy following an indeterminate result do not account for differences in overall benign open biopsy rates. Further studies are required to determine the indications for open biopsy in these cases and to evaluate the outcome in women who do not undergo open biopsy.

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Integration of the independent sector and the National Health Service in breast radiology: a working example

RJ Currie[1], RR Davies[2]
[1]Radiology Department, Royal Devon and Exeter Hospital, Exeter, UK; [2]Lister-in-Health, Exeter, UK
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The UK National Breast Screening Programme in Exeter has been exclusively run by the National Health Service (NHS) since it started in the early 1990s. The current medical climate is rapidly undergoing change, with increasing utilisation of outsourcing to independent providers. Certain domains, such as orthopaedics, have a high usage of independent providers; however in other domains, including breast radiology, the use is sparse.
Since 2005 the breast screening unit in Exeter has been privatised to Lister-in-Health on a separate site, whilst the symptomatic and surgical service has remained at the local hospital under the NHS. We would like to discuss how there is continuity in the care pathway for the screening patient, detailing how Lister Healthcare interacts with the local hospital breast service; how patient assessments and access to breast care nurses is carried out, and the point at which a patient leaves the screening service to enter the NHS treatment pathway. We also discuss the logistics of communication between the screening radiologists and surgeons, including discussion of histological findings, follow-up of nonsurgical lesions, assessment of B3 lesions, multidisciplinary teams and meetings.

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Effectiveness of screening a small population

ML Gaunt, K Darley
Princess Elizabeth Hospital, Guernsey, UK
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Guernsey provides healthcare for a population of 60,000. An on-island breast screening programme has existed since March 1995, with a 2-year screening round. Data have been analysed for six screening rounds to the end of March 2007, and have been evaluated against the National Health Service Breast Screening Programme (NHSBSP) Pritchard Standards. The small cohort size (<4,000 per annum) necessitates off-island screen reading by NHSBSP readers. Assessments are performed in Guernsey by a single breast radiologist. The majority of breast surgery is performed in Guernsey.
Over the six screening rounds, a total of 39,166 screening mammograms have been performed, 2,542 assessment visits have been made, and 208 cancers have been identified (149 invasive, 59 ductal carcinoma *in situ*). Examples of standards evaluated for the six rounds: compliance, >90%; standardised detection rate, range 0.6 to 1.83; small cancer detection rates, 2.46/10,000 (average); interval cancers, 1.22 per 1,000 screened (average); 10-year survival from screen-detected cancers, 92%.
These data show an effective screening programme assessed by Pritchard Standards, and demonstrate a model for the delivery of breast screening in a small isolated population.

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Implementing barcode film-reading in the National Health Service Breast Screening Programme: the good, the bad and the ugly

ME Wheaton, K Stoddard
Coventry Breast Screening Training Centre, Coventry, UK
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The National Breast Screening Computer System (NBSS) was redeveloped in 2003 and was rolled out to the programme during 2004. Following the national initiative to convert all breast screening programmes in England to use the NBSS system, barcode film-reading functionality and the NBSS daybook software were developed and piloted during 2005/06.
Although this functionality has been available now for nearly 3 years, services have been slow to implement this change for a variety of reasons. Lack of funding for new hardware, inappropriate accommodation, lack of space and a general unwillingness to change have been sited as reasons for not implementing barcode film-reading and/or the NBSS daybook.
The Coventry Breast Screening Training Centre has invested considerable time with many breast screening services, helping them implement this functionality. The Centre has helped services adapt their processes to this new way of working whilst maintaining the integrity of their Right Results procedure.
It is hoped that this practical guide will persuade the remaining services to convert to this new functionality during 2008 and to help those already using this functionality to overcome any issues.

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What makes a good mammographer? Looking at the homogeneity of those groups who perform best and least well on the PERFORMS self-assessment scheme

HJ Scott, AG Gale
Loughborough University, Loughborough, UK
Breast Cancer Res 2008, **10(Suppl 3):**P74 (doi: 10.1186/bcr2072)

The Personal Performance in Mammographic Screening (PERFORMS) scheme originated in 1991 and functions as a free educational tool whereby film-readers routinely evaluate and receive immediate and confidential feedback on 120 cases, bi-yearly. In addition, most individuals complete a short questionnaire describing real-life factors such as years of reading experience and most typical screening practice (for example, reading duration, frequency, and case volume). From these data we identified those individuals who performed best (as a measure of excellence in film-reading) and those who performed less well on PERFORMS with a view to establishing a general film-reader profile. Previous research has shown that individuals who read a lower volume of cases (for example, new film-readers) may perform less well for sensitivity measures. We also looked at occupational differences in these profiles to determine whether radiologists and advanced practitioners were significantly represented in either performance group. We investigated low/high group profiles by analysing over 400 film-readers' questionnaire/performance data for a recent PERFORMS scheme. This analysis concentrated on possible within-group similarities in style and manner of film-reading according to self-report. We elucidate what characteristics and practices, from self-report, are the most common for breast-

screening film-readers within a high/low performance group, with a view to possible training recommendations.

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Digital screening on a mobile unit: the Coventry experience

S Hoffmeister, A Stanton
University Hospitals Coventry & Warwickshire NHS Trust, Coventry, UK
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Many National Health Service Breast Screening Programme Screening Services are changing from analogue to digital technology. Coventry was the first Screening Service to screen digitally on a mobile unit. There are several factors that need to be considered when planning to staff and equip a Full-field Digital Mammography Breast Screening Service. In view of the planned age expansion announced in the Cancer Reform Strategy, most units will need to consider planning for these changes. These considerations will include our local experience of drivers for change, workforce planning, managing extended working days, maintaining screening-round length, and some equipment issues.

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Managing interval cancers

J Hackney, L Chapman
University Hospital Coventry and Warwickshire, Coventry, UK
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The new National Health Service Breast Screening Programme Interval Cancer Operational Manual (2008) has recently been launched and is a practical guide for quality assurance reference centres, cancer registries and breast screening units to record and report interval cancers, with the aim of standardising practice across the United Kingdom. Coventry has always been at the forefront of this important work and, as part of the skill mix, the role of collecting and reporting data has been taken on by radiography film-readers. Coventry is the base for four different primary care trusts and the film-readers have links with multidisciplinary team meetings, breast care nurses, pathology and X-ray departments from all these areas, and are also involved with symptomatic mammography and local and regional interval cancer audits. The present poster demonstrates the pathway taken to collect and record information for audit and to forward it to the quality assurance reference centre for regional and national review.

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Initial experience with a new ultrasound imaging technique to measure tissue viscoelasticity

J Souquet[1], A Athanasiou[2], M Fink[3], J Bercoff[1], M Tanter[3], A Tardivon[2], T Deffieux[3], JL Gennisson[3]
[1]SuperSonic Imagine, Aix en Provence, France; [2]Institut Curie, Paris, France; [3]Laboratoire Ondes et Acoustique, Paris, France
Breast Cancer Res 2008, **10(Suppl 3):**P78 (doi: 10.1186/bcr2076)

Introduction SuperSonic Imagine has developed a unique ultrasound platform that can image supersonic shear wave (SSW) propagation and determine quantitative elastic properties of tissue. The accuracy of this system's elastography was evaluated with the characterization of breast nodules.
Methods Thirty-six breast nodules (4 mm to 22 mm, 25 benign and 11 malignant; BI-RADS category 3 = six cases, category 4 = 21 cases, category 5 = seven cases and category 6 = two cases) were prospectively evaluated in 34 patients (age 42 to 71 years; mean age, 59 years). Radiohistological correlations were available for all cases (fine-needle aspiration = 10 and/or core biopsies = 26). Data were processed to reconstruct the SSW colour images and to obtain quantitative elasticity in kiloPascal units.
Results SSW elastography detected all breast nodules, and the 1 mm system resolution facilitated the detection of small or isoechoic lesions. The mean elasticity of malignant lesions was significantly higher than the mean value of benign lesions (170 ± 41.6 kPa versus 62 ± 21 kPa). Owing to different displacement rates of solid versus cystic material, this technique correctly characterized the cystic component of complicated cysts in B-mode ultrasound.
Conclusion Quantitative SSW elastography allows a reliable, reproducible and user-independent measurement of tissue elasticity, thus providing a complementary tool for breast lesion diagnosis.

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Assessing mammography film-reader performance

LS Wilkinson[1], P Taylor[2], H Potts[2]
[1]St Georges Healthcare NHS Trust, London, UK; [2]Centre for Health Informatics and Multiprofessional Education, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P79 (doi: 10.1186/bcr2077)

Introduction Mammography film-readers in the National Health Service Breast Screening Programme are required to read 5,000 screening mammograms per year, and to participate in Personal Performance in Mammographic Screening (PERFORMS). It is known that individual cancer detection rates are higher when individuals perform high volumes of breast imaging annually, and that poor performance may be identified by PERFORMS. We have looked more closely at details of reader performance to guide individuals on how practice may be improved.
Method At our institution, films are double-read by radiologists and advanced practitioners, with arbitration by consensus of two readers. Information on 12 months of activity was obtained from the National Breast Screening Service, and data on individual workload, recall to arbitration rate, cancer detection rate and cancers detected by only one reader were compared.
Results There is a weak association between the recall rate and the cancer detection rate, and in general readers with high recall rates miss fewer cancers. Overall the cancer detection rate is similar on both first and second reads, although some readers perform best on first read and others on second read. Feedback of these data and discussion of arbitrary levels of preferred recall rates and cancer detection rates is used to inform personal practice.

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Lateral-approach stereotactic vacuum-assisted 10 G breast biopsy using Vacora for indeterminate microcalcifications: results of a single-institution assessment of 172 procedures

EM Vanherreweghe, M Mortier, R Van den Broecke, H Depypere, M Praet, G Villeirs
University Hospital Ghent, Belgium
Breast Cancer Res 2008, **10(Suppl 3):**P80 (doi: 10.1186/bcr2078)

Objective To report the results of Vacora biopsy under lateral-approach stereotactic guidance.

Methods Two hundred and fifty procedures were performed in 249 consecutive patients. Specimens were sampled until at least one contained microcalcifications. Surgery was performed whenever malignancy or borderline lesions were found ($n = 114$). Normal results were mammographically followed up ($n = 58$). No adequate follow-up was available for 78 procedures.
Results An average of 4.6 specimens were sampled per procedure. Cancer was diagnosed in 40% of cases: 9.4% invasive ductal carcinomas, 1.2% invasive lobular carcinomas and 29.4% intraductal carcinomas (ductal carcinoma *in situ*). Borderline lesions were found in 6.1% of cases, mainly atypical ductal hyperplasia (5.7%). The remaining 53.9% of biopsies showed normal or benign findings. The procedure was nondiagnostic in 2% of cases. Vacora biopsy and subsequent surgery were concordant in 89.5% of cases. In 10.5%, biopsy revealed ductal carcinoma *in situ* while surgery proved invasive carcinoma. In 58 patients who were mammographically followed-up for at least 6 months, no evolution was detected.
Conclusion Biopsy using Vacora under lateral-approach stereotactic guidance is an easy and intuitive technique for diagnosis of breast microcalcifications. An average of 4.6 specimens per procedure is sufficient to sample representative calcifications for reliable cancer diagnosis.

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Promoting early presentation of breast cancer amongst older women: radiographers' experiences of taking on a new role

L Tucker[1], L Omar[1], C Burgess[1], L Kedge[1], P Whelehan[2], A Ramirez[1]
[1]Institute of Psychiatry/King's College London, UK; [2]King's College Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P81 (doi: 10.1186/bcr2079)

Introduction The London Psychosocial Group has been funded by Cancer Research UK to implement and evaluate a psychoeducational intervention to promote early presentation amongst older women with breast cancer. The intervention is designed to be radiographer-delivered to women receiving their final invited mammogram with the National Health Service Breast Screening Programme.
Objective To report the experiences of research radiographers in delivering the 10-minute intervention to women in breast screening clinics.
Methods Reflective diaries and supervision records were used to collate the experiences of radiographers delivering the intervention as part of a research trial and to discuss emerging issues and challenges for widening the role of diagnostic radiographers across the National Health Service.
Results The main challenges included learning and rehearsing a structured interview, delivering complex health messages within time constraints using behavioural change techniques, and dealing with unexpected events, including emotional distress, during interviews. Benefits included enhanced interaction with women attending screening and extending the usual role of the radiographer.
Conclusion It was beneficial yet demanding for radiographers to extend their role in this way. Not all radiographers may be motivated or suitable to undertake this work. Training and ongoing supervision are essential to support radiographers who deliver the intervention.

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Does size matter? A review of screen-detected microcalcifications seen at breast screening assessment

LIG Haigh
Breast Screening Unit, Leeds, UK
Breast Cancer Res 2008, **10(Suppl 3):**P82 (doi: 10.1186/bcr2080)

A retrospective review was performed of 282 patients who were recalled to the breast screening assessment clinic for further evaluation of microcalcification over a 12-month period from 1 April 2005 to 31 March 2006.
Patients were subdivided into one of four groups according to the size of the calcification cluster and the pathology was reviewed to investigate the likelihood of diagnosing malignancy, either *in situ* or invasive, with differing extents of radiological abnormality.
Further mammographic views were performed in all cases and stereotactic core biopsy in 252 cases (89%). Thirty-one patients were felt to either not be suitable for or not to need biopsy after further mammography and were subsequently placed on early clinic review or routine recall. Where the biopsy failed to obtain calcification, the options of mammotome or early review were considered at the multidisciplinary team meeting. A summary of the findings is presented in Table 1.

Table 1 (abstract P82)

Size (mm)	Number of cases	Ductal carcinoma *in situ*	Invasive cancer
<5	64	8 (12.5%)	3 (4.6%)
6 to 10	77	14 (18.2%)	4 (5.2%)
11 to 15	28	1 (3.5%)	2 (7.1%)
>15	113	31 (27.4%)	21 (18.5%)

Small calcification clusters were often malignant (12.5% <5mm) and included cases of invasive disease in 4.6%. They present a diagnostic challenge in detection and management, but may represent small invasive tumours.

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Imaging features of male breast cancer: a pictorial review

CR Lloyd, PL Scott-Mackie, RD Leach, CS Ward
Kingston Hospital, Kingston-upon-Thames, UK
Breast Cancer Res 2008, **10(Suppl 3):**P83 (doi: 10.1186/bcr2081)

Introduction Breast cancer in men is rare, accounting for less than 1% of all breast cancer cases. Presentation includes a lump, pain and nipple discharge, and breast malignancy must be differentiated from benign disease, particularly gynaecomastia. We have diagnosed 17 men with breast cancer between 1998 and 2007.
Methods A retrospective review of imaging of men with histologically proven breast cancer in 10 years.
Results The mean age at diagnosis was 63 years (range 38 to 87 years). Presentation was with a mass in 15 patients and with nipple discharge in two patients. Eleven patients had mammography and breast ultrasound (US). Mammography and US demonstrated a mass in nine patients. The US lesions were echo-poor solid lesions in eight patients and a mixed solid/cystic lesion in one patient. Calcification and skin/nipple changes were each seen in five cases. Mammogram demonstrated an asymmetric density in one patient, and in this case US was normal. Bilateral gynaecomastia was detected on mammogram and US in one patient. Histology in 14 patients demonstrated invasive ductal carcinoma with foci of

ductal carcinoma *in situ* in six patients. Three patients had ductal carcinoma *in situ* only.

Conclusion Male breast cancer most commonly manifests as a discrete mass lesion on imaging, but radiologists need to be aware of other imaging appearances.

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Eliciting requirements for a mammography training application

PM Taylor[1], M Hartswood[2], L Blot[1], S Anderson[2], L Wilkinson[3], E Anderson[4], R Proctor[5]
[1]University College London, UK; [2]University of Edinburgh, UK; [3]Duchess of Kent Screening Unit, London, UK; [4]Ardmillan Screening Unit, Edinburgh, UK; [5]University of Manchester, UK
Breast Cancer Res 2008, **10(Suppl 3):**P84 (doi: 10.1186/bcr2082)

Demonstrations of a prototype were used to elicit requirements for a training system for screening mammography. The prototype allowed mentors to select cases from a distributed image database to meet the specific requirements of trainees. Trainees received automated feedback in response to attempts at interpretation. The prototype was demonstrated to radiologists and radiographers. Comments were recorded and used to elaborate requirements for a more sophisticated version.

The main classes of response were as follows: *automated marking and feedback* – where the trainee's interpretation did not match the experts' opinion exactly, the prototype acted is if the trainee required correction, which was not always appropriate; *integrating with existing training practices* – discussion between trainees and mentors is important, and suggestions for supporting such communication included providing comment facilities and the ability to bookmark cases for further discussion; and *searching and browsing cases to build training sets* – the provision for constructing training sets appropriate for different teaching goals is highly valued.

We are following an iterative process where requirements are gathered, and prototypes are constructed, evaluated by users and then refined until users are satisfied that their requirements have been met. A new version of the tool has been developed.

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Mammographic interpretation training: what exactly do film-readers want?

Y Chen, A Gale, H Scott
Applied Vision Research Centre, Loughborough University, Loughborough, UK
Breast Cancer Res 2008, **10(Suppl 3):**P85 (doi: 10.1186/bcr2083)

The introduction of digital mammography opens up new opportunities to provide a wide range of training to individuals without the restriction of the mammographic multiviewer. Whilst high-resolution monitors in an appropriate viewing environment are *de rigour* for actual reporting of screening cases, the advantage of the digital image over film is in the flexibility of training opportunity afforded (for example, web-based training, or tailored training on personal digital assistants). A previous study indicated the possible potential for reporting mammographic cases utilising handheld devices (providing suitable human–computer interaction techniques are employed). The UK self-assessment scheme Personal Performance in Mammographic Screening (PERFORMS) has also identified where tailored training may be beneficial. Initially, groups of mammographers were questioned in semistructured interviews in order to help establish film-readers' training preferences. Content analysis revealed several main categories of training issues, including requirements of individualised tailored training, the location and timing of training opportunities, the ease of user interaction and film-readers' perspectives on the possible clinical applicability of mobile devices. Subsequently, several breast screening units completed a questionnaire concerning current and anticipated training requirements. It is concluded that digital breast imaging facilities tailored training for an individual that can be achieved using mobile devices, and this is currently under development.

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A review of breast cancers found in the Welsh Family History screening programme

S Bolt, J Jones, M Rogers, J Evans, K Gower Thomas
Breast Test Wales, Cardiff, UK
Breast Cancer Res 2008, **10(Suppl 3):**P86 (doi: 10.1186/bcr2084)

Mammographic screening for women at increased risk due to a family history commenced in 2001 in Wales. Forty-one cancers have been found, and 31 were screen detected. One-half were in the high-risk category.

Of the high-risk cancers, 47% were grade 3 and 41% were node-positive, despite annual screening. Ductal carcinoma *in situ* was frequently found, and 75% of this was of high nuclear grade. In the moderate-risk group there was an even spread of cancer grade, fewer cases of ductal carcinoma *in situ* and no node-positive tumours.

The most common mammographic findings were calcification and glandular asymmetry.

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Common uses of immunohistochemistry in interpreting lesions of the breast: a pictorial review

T Hoang[1], R Rattan[2]
[1]Radiology Department, St George's Hospital, London, UK; [2]Cellular Pathology, St George's Hospital, London, UK
Breast Cancer Res 2008, **10(Suppl 3):**P87 (doi: 10.1186/bcr2085)

The present pictorial review includes a brief explanation of the basic principles involved in immunohistochemistry and an overview of its use as a problem-solving and prognostic tool in the context of breast disease.

Myoepithelial markers cytokeratins 5/6, p63 and smooth muscle actin are helpful in distinguishing lesions that mimic invasion, namely radial scar and sclerosing adenosis from invasive lesions. These markers can also be used in differentiating intraductal papilloma from papillary carcinoma, and their patterns of expression can help distinguish ductal carcinoma *in situ* from atypical ductal hyperplasia. Epithelial markers such as AE1/AE3 and cytokeratin 7 may identify subtle foci of stromal invasion and micrometastasis in lymph nodes. Each of the above scenarios is illustrated with radiological and pathological images, and shows the role of immunohistochemistry in attempting to resolve these diagnostic dilemmas.

The role of this technique in the typing of certain breast tumours is discussed and illustrated using E-cadherin in distinguishing ductal from lobular carcinoma.

Finally, the prognostic role of immunohistochemistry in oestrogen receptor, progesterone receptor and human epidermal growth factor receptor 2 analysis for primary breast carcinomas is illustrated.

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The scope for a rapid digitiser of mammograms and other large-file, high-resolution images

R Grant, M Alsewan
Barking, Havering and Redbridge Hospitals NHS Trust, Romford, UK
Breast Cancer Res 2008, **10(Suppl 3):**P88 (doi: 10.1186/bcr2086)

A new high-speed, high-resolution digitiser has provided a facility with which new means of communication and interaction become possible.

1. The DicomNow Digitiser camera system will scan mammography film at a 16-bit depth in less than 1 second.
2. The thresholds for compression of mammogram images have previously been confirmed at a ratio between 65:1 and 80:1.
3. New opportunities for transmission between centres; difficult analogue films can be digitised quickly, then compressed and sent for consensus/arbitration views from an expert panel or submitted to computer-aided diagnosis.
4. Applications to multidisciplinary team meetings in which all types of images, patient information and pathology are shared via any Internet link in a virtual meeting room.
5. The speed of DicomNow and the compression system removes time limitations for telemedicine communication speeds in mammography.
6. Archive potential to reduce storage cost and support disaster-recovery initiatives.
7. Modular training programmes will benefit students with access to high-resolution images via the scanning and compression technology.
8. Higher level studies of subtle features of image interpretation for validated case studies.

Each of these elements will be expanded to illustrate the effects of high-speed digitising on breast cancer management.