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ABSTRACT BOOK

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Symposium Mammographicum 2018 Meeting Abstracts

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Oral presentations

1.1 NHSBSP survey of radiation dose in breast tomosynthesis, 2017

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Background: National surveys of doses in mammography have been carried out for the NHS Breast Screening Programme at 3-yearly intervals since 2002[1,2]. These surveys are part of the quality system. As tomosynthesis is now used for assessment in many screening centres, it became feasible in 2017 to carry out a survey of mean glandular dose (MGD) in breast tomosynthesis.

Methods: Physics services sent data, from breast dose surveys already conducted, to a central point for collation and analysis. Details of exposures had been recorded by radiographers during examinations, or extracted from image DICOM headers with software. Data on X-ray set performance were available from physics services' measurements. All data was recorded with the same dose software to facilitate analysis.

Results: Data were recorded for approximately 15,000 images, acquired on 41 X-ray sets. Data was submitted for 35 Hologic, 1 GE and 5 Siemens X-ray sets. The overall average MGD for oblique views of breasts of all thicknesses was 2.5mGy for the Hologic systems, 2.1mGy for Siemens systems and 1.6mGy for the GE system. For oblique views of 50-60mm thick breasts the average MGD was 2.1mGy for the Hologic systems, 1.7mGy for Siemens systems and 1.4 mGy for the GE system. Further data will be included in the final presentation, including some 2D image data.

Conclusion: Measured MGDs for 50-60mm breasts were well below the national diagnostic reference level of 3.5mGy, which has been proposed for tomosynthesis[3] as well as for 2D imaging.

References:

1. Young KC, Oduko JM. Radiation doses received in the United Kingdom breast screening programme in 2010 to 2012. *Br J Radiol*, 2016 89: 20150831
2. JM Oduko, KC Young. Patient Dose Survey of Mammography Systems in the UK in 2013-2015. *Proc IWDM 2016, LNCS 9699*: 1-8

3. van Engen RE, Bosmans H, Bouwman RW et al. Protocol for the Quality Control of the Physical and Technical Aspects of Digital Breast Tomosynthesis Systems. Version 1.01. www.euref.org 2016

1.2 Symptomatic recall in the fatty breast: is it necessary?

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NHS Greater Glasgow and Clyde

Purpose: Currently all women with reported or observed symptoms at screening are recalled for assessment, irrespective of breast density. Mammographically occult cancers were considered unlikely within an entirely fatty breast, assuming the symptomatic area was imaged. Therefore, the recall of these patients maybe causing unnecessary patient anxiety and clinical workload. This retrospective review was performed to establish whether these women could be returned to routine recall without assessment.

Materials and Methods: All women coded as symptomatic were identified from assessment clinic sheets between 01/01/17 – 01/10/17. This was confirmed on Scottish Breast Screening Service software and the symptom classified as 'lump', 'skin dimpling' or 'nipple changes'. Axillary symptoms were excluded. The M (mammogram), U (ultrasound) and E (examination) and any B (pathology) scores were recorded. Imaging was reviewed on PACS and breast density assessed according to BI-RADS criteria, from A (almost entirely fatty) to D (extremely dense).

Results: 195 women were identified. Of these 163 cases were included. 56 patients (34.3%) had almost entirely fatty breasts, of these only 13 had additional imaging. The vast majority (39, 74%) were considered entirely normal on imaging and examination whilst a quarter (14, 26%) had benign changes. None had suspicious findings and no biopsies were performed. In the same period four indeterminate or malignant lesions were found in symptomatic women recalled with non-fatty breasts.

Conclusions: Symptomatic recall in patients with mammographically normal fatty breasts may be unnecessary.

1.3 Variations of mammographic breast density in patients diagnosed with Invasive Ductal Carcinoma with or without ductal carcinoma

in-situ component on core biopsy undergoing primary breast conservation surgery or subsequent re-operation - a case control study

Andrew Evans, Jane Macaskill, Sarah Vinnicombe, Georgi Georgiev
NHS Tayside

Objectives: The aim of this retrospective study was to examine how mammographic breast density (MBD) varies in patients diagnosed with invasive ductal carcinoma (IDC) with or without ductal carcinoma in-situ (DCIS) component on core biopsy who underwent primary breast conservation surgery (BCS) or subsequent re-operation.

Methods: Data was obtained from a local cancer audit database and electronic patient records for patients diagnosed with IDC who underwent primary BCS between January 2014 and June 2017 at a single institution. Patients undergoing re-operation for positive radial margins ($<1\text{mm}$) were matched for age (within 3 years) and referral type with controls having a single operation (clear margins) in a 1:2 ratio. MBD was assessed using BIRADS 4th edition score by a radiologist blinded to outcomes. Approval was obtained from the local Caldicott guardian for use of patient data. Data were analysed based on re-operation status, presence of DCIS on core biopsy and BIRADS.

Results: Of 573 patients undergoing BCS for IDC, 55 (9.6%) underwent re-operation for positive radial margins. There was a weak positive correlation between presence of DCIS on core biopsy and higher BIRADS (Spearman's $R=0.22$, $p=0.004$). Patients having re-operation for positive margins with DCIS on core biopsy had the highest mean BIRADS.

Conclusions: The presence of DCIS on core biopsy is correlated with a higher BIRADS MBD score on mammography. Further study is needed to assess whether presence of DCIS on core biopsy and higher diagnostic MBD pre-operatively are associated with an increased risk of repeat surgery.

1.4 Predicting axillary node metastases in breast cancer: sonographic features and tumour characteristics

Nikhil Patel, Clare Peacock, Juliet Morel, Rema Wasan, Rumana Rahim, Shalini Wijesuriya, Bhavna Batohi, Michaela Michell, Keshthra Satchithananda
King's College Hospital

Purpose: To evaluate axillary ultrasound (AUS) in identifying nodal metastases and disease burden in patients with breast cancer and to assess axillary lymph node (ALN) features and primary tumour characteristics associated with ALN metastases.

Methods: Retrospective single centre study of symptomatic and screen detected primary breast cancers ($n=119$) with clinically negative axilla diagnosed between April and September 2017. Node characteristics on AUS (cortical thickness, loss of morphology, long-short [LS] ratio) were compared with sentinel lymph node biopsy or axillary node clearance histopathology. Tumour type, size and grade obtained from post-operative histopathology.

Statistical analysis using univariate chi-square and receiver operator characteristic (ROC) curve.

Results: 38/119 (32%) of breast cancers had nodal metastases. In univariate analysis, lymphovascular invasion, Grade 2/3 tumours, LS ratio ≤ 2 and symptomatic presentation were significantly associated with ALN metastases. ROC curve analysis found cortical thickness to be a reliable discriminator of nodal disease with an optimal cut off identified as $\geq 3\text{mm}$ (sensitivity 65.7%, specificity 95.6%, PPV 88.5%, NPV 84.5% and accuracy of 85.44%). Subgroup analysis of T1/2 cancers demonstrated low volume axillary disease with only 3.5% (3/84) having >2 lymph nodes involved - all detected on AUS. AUS did not identify low volume (≤ 2 nodes) axillary disease in 11.9% (10/84) of cases.

Conclusions: Cortical thickness remains a reliable discriminator of ALN metastases and adoption of a threshold of $\geq 3\text{mm}$ should be considered. Where AUS fails to identify ALN metastasis is in low volume disease which recent studies suggest may not be significant in 10-year survival outcomes[1].

References:

1. Giuliano AE, Ballman KV, McCall L, Beitsch PD, Brennan MB, Kelemen PR, Ollila DW, Hansen NM, Whitworth PW, Blumencranz PW, Leitch AM. Effect of axillary dissection vs no axillary dissection on 10-year overall survival among women with invasive breast cancer and sentinel node metastasis: the ACOSOG Z0011 (Alliance) randomized clinical trial. JAMA. 2017;Sep, 12;318(10):918-26.

1.5 Ultrasound accuracy in predicting residual tumour size after neoadjuvant chemotherapy (NACT) in different breast cancer subtypes

Tania Policastro, Katerina Micha, Anastasia Peppe, Francesca Muscara, Marios Konstantinos Tasoulis, Pooja Padmanabhan, Peter Barry, Fiona MacNeill, Jennifer Rusby

Royal Marsden Hospital

Background: Response to NACT varies according to subtype. Imaging is used after NACT to evaluate residual disease and to tailor surgical plans. Ultrasound is of similar accuracy to MRI [1]. Although Vriens reported by subtype, the numbers were small. We sought to evaluate ultrasound performance in our own cohort, compared with the gold standard of histopathological tumour size.

Methods: Patients who underwent surgery after NACT between January 2010 and December 2015 were included. Ultrasound was performed towards the end of NACT. Data collection was retrospective, from prospectively maintained electronic patient records. Results were examined according to whether a complete response was reported on ultrasound (uCR) and further categorised according to ER and Her2 status.

Results: 597 patients were included. The most clinically relevant findings were:

- 1) uCR has the potential to miss large volume residual disease (max>40mm in all subtypes); most likely in ER+ Her2- disease (upper quartile pathological size 30mm).
- 2) uCR was reported in only 24 of 213 ER+ Her2- cases, and in only 8 (33%) did this correspond to a pCR.
- 3) Conversely, 57% of patients with residual ER-Her2+ disease on ultrasound, achieved a pCR.
- 4) Of ultrasound measurements of residual disease, approximately 1/3 were within 10mm of pathological size, 1/3 undersized by >10mm and 1/3 oversized by >10mm.

Conclusion: Despite careful imaging, prediction of pCR and quantitation of residual disease remain problematic. Additional imaging / biopsy may be warranted in ER+Her2- and ER-Her2+ disease to avoid under- and over-treatment respectively.

References:

1. Vriens BE, de Vries B, Lobbes MB, van Gastel SM, van den Berkmoortel FW, Smilde TJ, van Warmerdam LJ, de Boer M, van Spronsen DJ, Smidt ML, Peer PG. Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer. *European Journal of Cancer*. 2016 Jan 1;52:67-76.

1.6 Mammographic image quality: Do radiographers and radiologists demonstrate comparable knowledge and preferences for positioning standards and criteria?

Rhonda-Joy Sweeney ; Sarah Lewis ; Mark McEntee

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Background and purpose: Inadequate positioning together with inconsistent criteria can lead to unnecessary repeat imaging and perhaps missed breast cancers. Image quality is evaluated by both radiographers and radiologists, however, it is unclear how image quality and positioning criteria are applied and validated.

Methods: Australian and New Zealand certified breast imaging radiologists (n=27) and mammographic radiographers (n=125) participated in a bespoke questionnaire via paper and online dissemination. The questionnaire rated the importance of known positioning criteria for both mediolateral and cranio-caudal (CC) projections, focusing on knowledge and the frequency of application for the CC projection in clinical practice.

Preliminary results: Radiographers were considered the most responsible practitioner for the assessment of positioning image quality by 92% of radiographers and 63% of radiologists. The '1 cm rule' was known by 76% of radiographers and 48% of radiologists, indicating lack of familiarisation with this criterion. For the CC projection there was a general agreement on importance of inclusion of the pectoral muscle, medial bias when positioning, and visualisation of retro-glandular fat. Conversely inclusion of postero-lateral tissue, even if medial tissue is compromised, was rated as more important by radiologists (35%) than by radiographers (21%). Radiographers' rated the '1 cm rule' to be more useful in considering positioning

accuracy. Inferential analysis between the two groups is currently being undertaken.

Conclusion: There are variations in published positioning criteria and differences are identified in radiologists' and radiographers' knowledge and preferences for applying positioning criteria.

Bibliography:

BreastScreen Australia. National Accreditation Standards. Australia: Joint Australian, State and Territory Government Program; 2015.

Ministry of Health. BreastScreen Aotearoa Policy and Quality Standards. Wellington, New Zealand.: Ministry of Health; 2016.

Mount J. Reject analysis: A comparison of radiographer and radiologist perceptions of image quality. Radiography. 2016;22(2):e112-e7.

Public Health England. Quality assurance guidelines for mammography including radiographic quality control. Fulwood House, Old Fulwood Road, Sheffield, S10 3TH, UK: National Health Service Cancer Screening

Sweeney R-JI, Lewis SJ, Hogg P, McEntee MF. A review of mammographic positioning image quality criteria for the craniocaudal projection. The British Journal of Radiology. 2017;91(1082):20170611.

2.1 Evaluating the impact of the NHS Breast Screening Programme on mortality from breast cancer in England: a case-control study

Roberta Maroni, Dharmishta Parmar, Amanda Dibden, Stephen Duffy

Queen Mary University of London

Background: The National Health Service Breast Screening Programme (NHSBSP) was implemented in the UK in 1988. Improvements in diagnostic techniques and treatments led to the need for an up-to-date evaluation of the benefit of the NHS BSP on risk of death from breast cancer. An initial pilot case-control study demonstrated that attending mammography screening at least once led to a mortality reduction of 39% [1].

Methods: Based on the same study protocol [2], an England-wide study was set up. Women aged 47-89 who died of primary breast cancer in 2010 or 2011

were selected as cases (8,458 cases). Two controls who were alive at the time of the case's death were selected per case. Controls were matched by date of birth and screening area (15,900 controls). Both cases and controls had been invited to at least one breast screening appointment.

Results: Conditional logistic regressions show a 51% reduction in breast cancer mortality (OR 0.49, 95% CI 0.46-0.53) for women being screened at least once. This percentage increases with the number of screens attended. A similar reduction in breast cancer mortality is observed for women screened in the three years before diagnosis.

Conclusion: Preliminary results suggest a protective effect of breast cancer screening against mortality from breast cancer. However, further analysis to adjust for potential biases, such as self-selection, is currently under way.

References:

1. Massat NJ, Dibden A, Parmar D, Cuzick J, Sasieni PD, Duffy SW. Impact of Screening on Breast Cancer Mortality: The UK Program 20 Years On. *Cancer Epidemiol Biomarkers Prev.* 2016;25(3):455-62.
2. Massat NJ, Sasieni PD, Parmar D, Duffy SW. An ongoing case-control study to evaluate the NHS breast screening programme. *BMC Cancer.* 2013;13:596.

2.2 Women's experiences of mammography: analysis of 1,196 free-text comments from a questionnaire study

Patsy Whelehan [1], Jennifer Boyd [2], Andy Evans [2], Gozde Ozakinci [3]

[1] NHS Tayside; University of Dundee; University of St Andrews; [2] University of Dundee; [3] University of St Andrews

Introduction: As part of a project aiming to develop comprehensive and valid measures of the mammography experience and its determinants, we analysed free-text comments from questionnaires completed by breast screening attendees.

Methods: Women were sent study invitations and questionnaires before their appointments. Those who chose to participate completed one questionnaire before attending, then two further questionnaires at the appointment.

Questionnaire items captured mammography experiences and potential influencing factors. Acceptability and face- and content validity had been tested. Free-text boxes were included to elucidate fixed response data. NVivo 11 software (QSR International) facilitated analysis.

Two researchers familiarised themselves with the data and agreed an initial codebook before formal coding. Results below are from the first coder; full consensus findings from two coders will be presented.

Results: Questionnaires were completed by 237 participants (52% response rate). Average age was 60; 124 (52%) had post-16 education; 208 (88%) reported previous mammography.

The two major themes were: “negative-perceptions/screening-barriers” and “positive perceptions/screening motivators”. There were over three times as many positive as negative comments. Pain and discomfort were the predominant negative subthemes, affecting the breast (n=62 text segments) and other body areas (n=34). Positive subthemes included belief in early detection (n=55) and positive perceptions of staff (n=427).

Of 174 comments on what was most important in determining experience quality, 112 (64%; 95%CI: 57%-71%) cited the mammographer’s behaviour/attributes while 23 (13%; 95% CI: 9%-19%) concerned pain.

Conclusions: While pain remains a major issue in mammography, the mammographer seems to be central to positive overall experiences.

2.3 5 year prospective follow up of patients with B3 lesions

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Newcastle Hospitals

A prospective database of all B3 lesions has been maintained since 2011, with all patients undergoing vacuum assisted biopsy/excision (VAB/VAE) if appropriate. If not upgraded following VAB/VAE, patients underwent 5 years annual surveillance mammography (ASM) or were discharged/returned to routine recall, depending on the presence of atypia. Outcomes audited over 5 years.

Number of ASMs, recall rate, symptomatic episodes and subsequent malignancy following B3 diagnosis

identified from database.

Between 10/2011 and 12/2016, 432 patients with a B3 diagnosis, without any co-existing malignancy, were recorded. 346 underwent second line VAB/VAE, which diagnosed 33 with malignancy. 18 patients had malignancy identified at diagnostic excision (11.8% malignancy upgrade rate).

381 patients underwent ASM, routine screening or were discharged, having 633 mammograms over 5 years. 29 patients were recalled from ASM (recall rate 4.5%). 48 presented symptomatically for further breast investigations. 1 recalled following high-risk MRI surveillance.

Additional investigations diagnosed 16 cancers; 1 following MRI, 4 symptomatic, 11 recalled from ASM (CDR of 2.9). 13 further B3 lesions and 49 benign diagnoses were made. 6/16 cancers were contralateral and 10 ipsilateral (6 at original site). 14/16 cancers invasive, 2/16 DCIS.

VAB/VAE for B3 lesions is an excellent alternative to diagnostic excision. However, subsequent ASM has a low recall and cancer detection rate, questioning whether ASM is necessary in this group of patients. Is finding a B3 lesion simply highlighting patients who would progress to a screen detected cancer anyway? If so, could they be safely returned to routine follow up within the screening program?

2.4 Difference in tumour characteristics between true interval and screen-detected breast cancers

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Southend University Hospital NHS Foundation Trust

Background: True interval breast cancers are non-false negative cancers detected between mammographic screenings. For cancers to develop in the three-year interval of the NHSBSP, it is plausible that they are inherently more aggressive and therefore grow rapidly. [1,2] We hypothesised that true interval breast cancers have more adverse tumour characteristics than screen-detected breast cancers.

Methods: Prospectively collected records from our NHSBSP population of 100000 between 1/4/2014 and 31/3/2015 were retrospectively analysed. Cases of true interval cancers were distinguished from missed interval cancers. All screen-detected cancers in the

same period were included as control. Recurrent cancers or cancers not surgically removed were excluded. Tumours were assessed for size, type, grade, multifocality/multicentricity, hormone receptor status, HER2 overexpression, lymphovascular invasion and axillary nodal involvement. Statistical analysis was performed with t-test and chi-square test for numerical and categorical variables, respectively (alpha 0.05).

Results: We identified 63 and 130 eligible patients with true interval and screen-detected breast cancers, respectively. True interval cancers were significantly larger (26.34 vs. 15.41mm, $p < 0.00001$), of higher grade (Grade III, 46% vs. 29.2%, $p = 0.015$), less likely to be ER (82.5% vs. 96.9%, $p = 0.001$) or PR positive (57.6% vs. 89.1%, $p < 0.00001$), and had higher rate of lymphovascular invasion (38.3% vs. 15.6%, $p = 0.001$). There was no significant difference in tumour type, multifocality/multicentricity, HER 2 overexpression and axillary nodal involvement.

Conclusions: We demonstrated that true interval breast cancers possessed more adverse tumour characteristics compared with screen-detected breast cancers. Patients with true interval breast cancers should generally be regarded as having a poorer prognosis.[3]

References:

1. Gilliland FD, Joste N, Stauber PM, et al. Biologic characteristics of interval and screen-detected breast cancers. *J Natl Cancer Inst.* 2000;92(9):743-
2. Kirsh VA, Chiarelli AM, Edwards SA, et al. Tumor characteristics associated with mammographic detection of breast cancer in Ontario Breast Screening Program. *J Natl Cancer Inst.* 2011;103:942-50.
3. Cianfrocca M, Goldstein LJ. Prognostic and predictive factors in early-stage breast cancer. *The Oncologist* 2004;9:606-16.

2.5 Comparison of performance of mammogram readers with breast magnetic resonance imaging (MRI) readers at an abbreviated breast MRI (FAST MRI) interpretation task: Results from a single centre multi-reader study using an enhanced data-set — abstract submitted on behalf of the FAST MRI study group

Lyn Jones [1], Samantha Harding [2], Rebecca Geach [1], Chris Foy [3], Victoria Taylor [4], Andrea Marshall [5], Janet A Dunn [5]

[1] Bristol Breast Care Centre, North Bristol NHS Trust; [2] North Bristol NHS Trust; [3] South West Research Design Service, NIHR; [4] University Hospitals Bristol NHS Trust; [5] Clinical Trials Unit, University of Warwick

Background: FAST MRI has been proposed as a screening tool for a wider group of women than those currently offered screening with breast MRI (1,2). Its shorter acquisition and reading times promise potential cost effectiveness. However, any proposed change in screening modality from mammograms to FAST MRI has workforce implications. We need to know whether NHSBSP mammogram readers, already adept at mammogram interpretation but with no previous experience of interpreting breast MRI, could quickly learn to read FAST MRI with minimal additional training. HRA and REC approval obtained (IRAS: 219332, REC: 17/SW/0142, EDGE: 4002).

Methods: 8 Readers (4 NHSBSP breast MRI and mammogram readers (Group 1) and 4 NHSBSP mammogram readers who do not read breast MRI (Group 2)) were all trained using a standardised training package. All Readers completed a test set of 125 anonymised FAST MRI examinations (250 breasts: 194 normal and 56 cancer) blinded to the other Readers' opinions; providing a total of 2000 interpretations.

Results: Overall concordance with the true result was 1745 (87%) when identifying MRI classification 4 or 5 as cancers (898/1000 (90%) for Group 1 Readers; 847/1000 (85%) Group 2 Readers). The inter-reader agreement, kappa, was 0.69 (95% confidence interval 0.65-0.72).

When identifying MRI 3, 4 or 5 as cancers, overall concordance was 1550 (78%) for all readers (777/1000 (78%) Group 1; 773/1000 (77%) Group 2) and kappa = 0.51 (95% confidence interval 0.47-0.54).

Conclusions: These results suggest that NHSBSP image readers could adapt to reading FAST MRI with minimal additional training.

References:

1. Kuhl CK. Abbreviated breast MRI for screening women with dense breast: the EA1141 trial. *Br J Radiol.* 2017;90:20170441
2. Jones LI, Dunn JA, Marshall A and Kuhl CK. Mapping the drivers of overdiagnosis to potential

solutions: Is the UK ready for an Imaging Biomarker
Solution to the Breast Screening Debate? BMJ 2017
<http://www.bmj.com/content/358/bmj.j3879/rr-3>Last
accessed January 2018

Poster abstracts

P1 Vacuum assisted biopsy weight -- does the radiological weight match the pathological weight?
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In 2012, we introduced first-line 10G-vacuum assisted biopsy (VAB) for all stereotactic biopsies. Subsequently, we evaluated upgrade rates to malignancy, showing very low upgrade rates with pathological samples in excess of 3g. However, it is unclear whether a weight obtained after biopsy in the radiology department would be equivalent to pathology weight following formalin fixation.

From August 2017, 10G-VAB samples obtained were weighed by both radiology and pathology on identical scales, checked for equivalence. Number of cores obtained and breast density were recorded at the time of biopsy. Statistical analysis using a paired t-test and linear regression was performed.

In this initial study, 69 10G-VABs were performed. 64/69 biopsies were for calcification. Radiological weights ranged from 0.16 to 9.01g, pathological weights from 0.7 to 7.8g. There were 2 B1, 32 B2, 6 B3, 25 B5a and 4 B5b diagnoses. Although pathology samples tended to be slightly heavier than the radiological weight, a paired t-test showed no significant difference between the two weights recorded for each sample. Furthermore, no significant difference between sample weight per core and breast density was demonstrated.

Core biopsy weights, measured immediately after acquisition in the radiology department, or following formalin fixation in pathology, are equivalent. Unexpectedly, no differences in core weight depending on the breast density could be demonstrated, suggesting that number of cores is the most important factor in ensuring an adequate weight of tissue is obtained. A set of scales in the radiology department are clinically very useful when performing VAB.

P2 Papillomas - Impact of the new UK B3 guidelines on lesion management

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[1] University Hospital North Tees, [2] Newcastle upon Tyne Hospitals NHS Foundation Trust

Introduction: Recent NHS BSP management guidelines for B3 lesions recommend diagnostic excision for papillomas with atypia and large volume biopsy (LVB) for those without, proceeding to diagnostic excision if further atypia present. Our routine practice is to offer all papillomas second-line LVB, following MDT discussion; with surgery if B5 and annual mammography/routine recall depending on the presence of atypia. We have evaluated the potential impact of these guidelines on our benign biopsy rate.

Method: By using a comprehensive review system, 25 images of papillomas diagnosed between 01/2012 and 12/2016, recording LVB outcome and subsequent investigations.

Results: 103 papillary lesions identified over 5 years.

96 papillomas without atypia; LVB upgraded 3 to B5 and 13 to B3 atypia. 5/13 of the upgraded lesions underwent excision biopsy (all benign).

7 papillomas with atypia; 1 LVB identified DCIS. 6 diagnostic excisions, 3 identified DCIS, 3 benign.

2 cancers developed during surveillance, remote from index papilloma; one B5a after 1 year, and one B5b after 5 years.

Currently, 11 diagnostic excisions identified 3 cancers, LVB identified 4. With new guidelines, 20 diagnostic excisions would identify 4 cancers and LVB 3.

Conclusion: 7% of papillomas were subsequently upgraded to B5. Surgery for papillomas with atypia identified DCIS in 50%, however, LVB could improve pre-operative diagnosis in this group. Diagnostic excision biopsies for LVB atypia upgrades were benign, and no progression to cancer during follow-up occurred. New B3 guidelines would double our diagnostic excision biopsies for papillomas and reduce our pre-operative diagnosis rate. Second-line LVB is a safe, effective management strategy for all papillomas.

P3 Clip migration after vacuum-assisted biopsy

Vivien Milnes, Asif Iqbal, Rema Wasan, Juliet

Morel, Keshthra Satchithananda

King's College Hospital

Purpose: Marker clip insertion following stereotactic guided vacuum biopsy is our standard technique when sampling micro-calcifications and soft tissue lesions not seen on ultrasound. However we have observed cases where the marker clip has migrated away from the original site after biopsy; it could result in inappropriate location of the target site for future needle localization.

Method: We retrospectively assessed patients who underwent stereotactic vacuum-assisted biopsy at our institution using Hologic Affirm prone breast biopsy system between November 2015 and November 2017. The screening mammograms consisted of large number of micro-calcifications and some distortions distinguishable on two views of the breast. Biopsies were performed with a 9-gauge core needle and clip (*HydroMark-Mammotome*) was placed. Size of lesions and clip displacements were recorded.

Results: Out of 408 who underwent stereotactic vacuum biopsy, 47 patients required clip localisation prior to surgery. Marker clip migration occurred in six cases (12.7%). The clip displacement distance ranged from 9 to 20 mm (median=9 mm, mean $\pm$ standard deviation = 9.0 ± 6.7 mm).

There are several factors which could have influenced the migration of marker clips e.g. size of biopsy cavity, presence of post biopsy haematoma, post biopsy positioning, breast compression and accordion effect.

Conclusion: Clip migration is common and it is therefore important to perform pre-localisation mammograms when localisation of the clip is performed under ultrasound guidance. A much larger study is needed to support the suppositions to find a statistical significance.

P4 Painful vacuum assisted procedure: What's to blame?

Shahrooz Mohammadi ; Ashley Warren ; Mary

Sinclair ; Rosalind Given-Wilson ; Sam Dumonteil ;

Mamatha Reddy

St George's Hospital

Background/Objectives: Stereotactic and ultrasound guided vacuum-assisted biopsy (VAB) and excision (VACE) is an integral and established part of practice

at our institution. This has become the technique of choice in the management of most B3 lesions. The purpose of this audit is to determine the factors associated with a painful Vacuum assisted procedure.

Method: Prospective data will be collected on a total of 40 patients attending the assessment and the symptomatic clinics. Data will be collected from both operators and patients in form of a questionnaire, on a number of parameters including patient's pre-existing breast tenderness, patient anxiety level, type of procedure (stereotactic vs ultrasound), needle gauge, number of cores, length of procedure, type of lesion, lesion depth, breast density and strength of bupivacaine (0.25% vs 0.5%). The patients will be asked to complete a questionnaire after their vacuum assisted procedure and just prior to leaving the department. They will be asked to score the pain they experienced during the procedure as none, mild, moderate or severe, which will be correlated with the different parameters.

Results: We will present our results.

Conclusion: By determining the factors associated with a painful vacuum assisted procedure we can establish whether there are any modifiable factors, which could be adjusted in our practice in order to make the procedure more tolerable and improve the overall patient experience.

P5 10—Gauge vacuum assisted breast biopsy versus 14—Gauge core biopsy in the management of B3/B4 lesions in the breast

Katie Walker-Stabaler

Heart of England NHS Foundation Trust

Background: A B3/B4 lesion of the breast diagnosed at 14-gauge Core Biopsy (CB) continues to prove challenging in terms of management (1). Current guidance states that definitive therapeutic surgery should not be performed as a result (2). National Breast screening guidance suggests Vacuum Assisted Breast Biopsy (VABB) should be used in the re-biopsy and investigations of B3/B4 lesions, (3).

Aims: To investigate whether or not the introduction of Ultrasound (US) and Stereotactic (ST) guided VABB procedures has a positive impact on the management of patients presenting with B3/B4 lesion of the breast, within this breast service.

Method: Retrospective 2 year sample of all B3/B4 14-gauge CB results of breast lesions taken under image guidance. Combination of patients being referred through breast screening assessment and symptomatic breast clinics.

Results: 85 patients had a B3/B4 14-gauge CB result. 82 patients included. All female with a mean age of 57 years old. 77 patients had a surgery. 5 patients avoided a surgery, all had a 10-gauge VABB procedure. In total, 29 patients had a 10-gauge VABB following 14-gauge CB.

Conclusion: 10-gauge VABB consistently proved to be a more sensitive test than 14-gauge CB. 10-gauge VABB also proved to have a higher PPV than 14-gauge CB meaning that VABB is more likely to correctly identify pathology of B3/B4 breast lesions. Papilloma's proved to be the most prevalent pathology within this population. Findings support the evidence that VABB has the potential to manage papilloma's without atypia with non-surgical management. A lesion specific study is recommended.

References:

1. Saraki, W A, Worku, D, Escobar P F, and Mokbel. Breast papillomas: current management with a focus on a new diagnostic and therapeutic modality. International Seminars in Surgical Oncology. 2006;3(1): 1-8. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1395317/pdf/1477-7800-3-1.pdf> [Accessed 13th July 2017].
2. The Royal College of Pathologists. Guidelines for non-operative diagnostic procedures and reporting in breast cancer screening. 2016. Available from: <https://www.rcpath.org/resourceLibrary/g150-non-op-reporting-breast-cancer-screening-feb17-pdf.html> [Accessed 28th January 2017].
3. NHSBSP. Clinical guidance for breast cancer screening assessment. 2016. [4th Edition, Publication N. 49]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/567600/Clinical_guidance_for_breast_cancer_screening_assessment_Nov_2016.pdf [Accessed 14th February 2017].

P6 Large gauge vacuum excision - What do our patients think?

Jackie Finlay ; Barbara Dall ; Nicola Atkinson
Leeds Teaching Hospitals NHS Trust

Objective: This patient satisfaction survey aims to assess the following:-

1. Are we giving patients enough information before, during and after the procedure.
2. Are they comfortable and pain free during the procedure.
3. Is post biopsy bleeding, pain and bruising a significant problem

Method: A two part questionnaire was designed and the survey was conducted over a period of 3 months.

Part 1 was completed directly after the procedure

Part 2 was completed one week later by telephone appointment.

Results: (n=50)

SURVEY 1

100% of patients found the information given prior to the biopsy useful.

100% of patients said they were given the opportunity to ask questions prior to the procedure and that staff helped relieve anxiety.

78% of patients reported minimal or no pain during the procedure.

Only 1 patient said pain was not relieved during procedure.

92% felt pain relief was satisfactory overall. No-one said pain relief unsatisfactory.

SURVEY 2

98% found the post biopsy care satisfactory.

22% reported severe bruising, 38% moderate, 28% minimal and 12% none.

Only 4 patients sought advice following the procedure regarding bleeding, bruising and pain; telephone advice only.

92% of patients were satisfied.

Conclusion: Patients appeared to be well informed and tolerated the procedure very well.

The majority of patients felt well cared for during the procedure and any pain experienced was acted on immediately.

Bruising was reported in most cases, significant pain and bleeding was not an issue, a small minority sought telephone advice post biopsy.

Overall patients were very complimentary about the service.

P7 Is second line VAB always a superior alternative to WLE to achieve a diagnosis?

Meena Powell ; Bethan Bayley

Breast Test Wales

Background: With the aim of minimizing “over diagnosis” and “overtreatment” in the screening setting, national best practice has seen a shift towards minimally invasive means to achieve a definitive diagnosis and sometimes treatment. Our unit is no exception. We have attempted to summarise our outcomes in order to quantify and optimise our local practice.

Methods: All of our cases of screen-generated VABs over a 24 month period were compiled. Indications ranged from 14 g initial biopsy results of B3, B4, B5a where invasion was suspected, or B2 with discordant radiological features. Lesion types included microcalcification, soft tissue masses and architectural distortion. Presenting imaging features were recorded, with histology results, final diagnosis and outcome.

Results: Initial 14 gauge was performed under ultrasound or stereotactic guidance. The subsequent VABs were performed under stereotaxis with a 10 gauge Encore probe. We will provide a summary of our outcomes relating to final pathology, and whether further intervention in theatre was necessary.

Discussion: Our MDT aim is to use VAB as a tool to spare the patient an open operation with the associated risks of general anaesthesia. If a lesion is thought to represent a malignant or pre-malignant process, the radiology recommendation to the MDM would be to proceed to WLE where the chances of simultaneous diagnosis and treatment are higher, and margins would be removed intact.

Although the majority of women were spared an operation, a significant number were subject to WLE, to a much higher degree than we had initially anticipated.

P8 Now you see me, now you don't

Sally-Ann Gibbs ; John Nash ; Angelique Beling ; Rebecca Church

Portsmouth Hospital NHS Trust

Purpose: To identify which skin marker pen applied to breast in preoperative ultrasound localisation best withstands the dissolving/removing effect of surgical skin preparation. Having received several comments from our surgeons that since changing to an alcohol containing preparation in theatre, under the advice of infection control, the marker pen applied by radiology to localise impalpable tumours does not withstand the cleaning procedure. Thus making it harder for the surgeon to visualise marking after skin cleaning

Currently there is no evidence as to whether the pens that we use are optimal and have just been supplied by the trust.

Methods: We performed an internet based search on this topic and if there was guidance for best practice and did not find any relevant citations.

We have chosen an array of pens which all claim to have permanent qualities. We then used each pen to make a 5cm by 5cm cross on skin and took pictures before and after contact with skin preparation which contained chlorhexidine gluconate and isopropylalcohol to see which withstood the cleaning preparation for a standardised timeframe best. We measured outcomes as minimal loss of pigmentation density, traceability of centre cross and continuity of marker lines.

P9 A comparative evaluation of different breast markers and guidewire localisation devices used during stereotactic procedures

Rebecca Conlon, Deborah Nelson

Tameside Integrated Care Foundation Trust

Objectives: To measure accuracy and migration rates of localisation devices used during stereotactic procedures. Comparison between three marker clips (ribbon, gel-pellet and polymer) and two guidewire types (anchor and fishhook) used in clinical practice for service improvement and proof of clinical effectiveness.

Methods: A retrospective analysis of 103 consecutive post localisation mammograms collected from 2014-2018. The mammograms were reviewed by two independent reporters and breast density, breast

quadrant and the accuracy of placement in mm from the target was assessed against RCR (2008) guidelines.

Results: The distance from the target was measured (mm) displayed as a percentage for each device to show accuracy and migration.

Conclusions: Polymer marker clips demonstrated better accuracy compared to the ribbon and gel-pellet markers, however, a larger sample size is required for the gel-pellet markers to enable a fairer assessment (ongoing data collection).

The anchor guidewires show more accurate deployment than the fishhook type.

For complete assessment of this data a review of associated factors is indicated including:

- Breast density
- Accordion effect
- Deployment issues
- Marker material
- Migration along biopsy needle track
- Device design and tissue adherence

References:

1. Quality Assurance Guideline for Surgeons in Breast Cancer Screening NHSBSP Publication No. 29 2009 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465694/nhsbsp20.pdf

P10 Are axillary lymph node marker clips useful in the management of node-positive breast cancer treated with neoadjuvant chemotherapy?

Romney Pope, Marios Konstantinos Tasoulis, Briony Bishop, Nicola Roche, Fiona MacNeill, Steve Allen, Kate Downey

The Royal Marsden NHS Foundation Trust

Background: Neoadjuvant chemotherapy (NAC) can eradicate axillary disease in 40-75% of the cases (1, 2) suggesting that a proportion of patients could avoid axillary lymph node dissection (ALND). Sentinel lymph node biopsy (SLNB) can be used to reassess the axilla post-NAC in the setting of node-positive disease but its accuracy remains uncertain. Insertion of marker clip(s) into the dominant cancer-proven node(s) before NAC allows the retrieval of the clipped and the SLN

for pathology assessment post-NAC and may increase the accuracy of the technique (3). Our aim was to evaluate the utility of US-guided LN marker clips prior to NAC in patients with node-positive breast cancer.

Methods: Retrospective cohort study. Patients with clipped, LN-positive (biopsy-proven) breast cancer treated with NAC between 01/2015 and 06/2017 were identified. Simple descriptive statistics were performed.

Results: Data from 38 patients was analyzed. The marker clip was visible on pre-operative US in 15 patients (39.5%) but the clipped node was retrieved in 30 (78.9%). The overall pathologic complete response rate for the axilla was 50%. In 27 patients (71.1%) the SLN was identified (median SLN yield was 2); localization failed in 5 cases. In 16 cases (42.1%) the clipped node was the SLN but in 4 patients (10.5%), the non-sentinel clipped node showed metastatic carcinoma, while SLNB was negative, allowing more accurate axillary staging.

Conclusion: Our data suggest that targeted evaluation of the clipped LN is feasible and improves the accuracy of "SLNB" in patients treated with NAC, potentially sparing patients the morbidity of ALND.

References:

1. Fisher B, Brown A, Mamounas E, et al. Effect of preoperative chemotherapy on local-regional disease in women with operable breast cancer: findings from National Surgical Adjuvant Breast and Bowel Project B-18. *J Clin Oncol.* 1997;15(7):2483-93.
2. Dominici LS, Negron Gonzalez VM, Buzdar AU, et al. Cytologically proven axillary lymph node metastases are eradicated in patients receiving preoperative chemotherapy with concurrent trastuzumab for HER2-positive breast cancer. *Cancer.* 2010;116(12):2884-9.
3. Caudle AS, Yang WT, Krishnamurthy S, et al. Improved Axillary Evaluation Following Neoadjuvant Therapy for Patients With Node-Positive Breast Cancer Using Selective Evaluation of Clipped Nodes: Implementation of Targeted Axillary Dissection. *J Clin Oncol.* 2016;34(10):1072-8.

P11 Audit to assess clip migration post stereotactic core breast biopsy

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Background: Marker clips are often deployed after stereotactic core biopsy, as they are useful landmarks for wire localization. Clip migration may occur post biopsy and can have significant impact on clinical management (e.g. surgical excision) especially if target abnormality is completely removed during biopsy.[1,2]

This audit aimed to assess rate of clip migration post stereotactic core biopsy within our unit.

Standard: No nationally agreed standard in the U.K for adequacy of marker clip position hence standard for wire localization was used:

- 95% of clip markers should be within 10mm of target lesion[3]

Methods: Retrospective review of stereotactic biopsies performed within our unit between 23/06/2017 to 30/08/2017. Data recorded included procedure date, patient demographics, breast density, lesion morphology, biopsy approach and post biopsy clip position from target. Data analysis performed with Microsoft Excel.

Results: Total of 76 biopsy events during this period; 8 events excluded (four had no post biopsy images, two had targeting errors and two could not be categorized due to subtle nature of abnormality). Mean patient age within cohort was 57 years (range from 40 to 76 years).

Of remaining 68 events, most common mammographic abnormality was calcification (60%) and craniocaudal (71%) the most common biopsy approach. 94% clips were satisfactory in position. Of the unsatisfactory clip positions, 75% of target lesions were calcification and 50% had migrated proximal and 50% beyond target lesion. Mean distance migrated from target was 19mm.

Conclusion: Adequacy of clip position was just below the audit standard with migration predominantly occurring in events where target abnormality was calcification. Due to the complex nature of clip migration, a solitary cause is difficult to establish.

References:

1. Kass R, Kumar G, Klimberg VS, Kass L, Henry-Tillman R, Johnson A, et al. Clip migration in stereotactic biopsy. *Am J Surg* 2002 Oct; 184 (4): 325-31.

2. Rosen EL, Thuy T. Metallic Clip Deployment during Stereotactic Breast Biopsy: Retrospective Analysis. *Radiology* 2001; 218 (2): 510-516.

3. National Health Service Breast Screening Programme (Internet). Sheffield: NHS Cancer Screening Programmes. Quality Assurance Guideline for Surgeons in Breast Cancer Screening 2009 March (cited 2017 December). Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465694/nhsbsp20.pdf

P12 A retrospective audit of clip marker placement following mammographic 14g breast core biopsies, to determine accuracy and usefulness for future sampling/localisation

Liz Edwards, Alison Sweeney
Breast Test Wales

Purpose: To analyse the position of clip markers placed in breasts post mammographic 14 gauge breast biopsy, to determine accuracy and usefulness for further sampling or localisation and to evaluate the visibility of the lesion post biopsy.

Method: Data collected over a two year period. Pre and post clip images were retrospectively reviewed to ascertain position of the marker clip relative to the biopsy site, where inaccurate, the direction of clip migration was recorded along with direction of sampling and the breast tissue type, fatty or glandular.

Results: A total of 247 clip markers were placed at biopsy sites. 30% were in malignant sites, 70% in benign sites. There was a 20% inaccuracy in the position (>10mm away from the biopsy site). The travel of the clip was along the biopsy tract in the 94% of cases demonstrating “the accordion effect”[1] Fatty breast tissue had slightly more inaccuracies than glandular tissue.

Conclusion: A review of techniques used to place clip markers is required. Although a high proportion of lesions could still be visualised post biopsy, clip markers are extremely useful for cases where localisation would be very difficult saving the clinician time and are a benefit to the service. A large proportion are placed at benign sites, case selection for clip markers should be reviewed, although at outset it may be difficult to pre-empt the pathological findings. The technique used to place clip markers should be

adjusted to counteract the “accordion effect”[1] and therefore improve the accuracy of clips.

References:

1. Lisa E. Esserman MD, Marco A. Cura MD and Darlene DaCosta MD. Recognizing Pitfalls in Early and Late Migration of Clip Markers after Imaging guided Directional Vacuum-assisted Biopsy. *RSNA Radiographics*; January 2004. Volume 24 Issue 1,
2. Available from: <https://doi.org/10.1148/rg.241035052> (accessed 31/01/2018).

P13 Initial investigation of reading efficiency from experienced radiologists interpreting digital breast tomosynthesis (DBT) images

Leng Dong, Yan Chen, Qiang Tang, Alastair Gale
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Introduction: Digital Breast Tomosynthesis has several advantages over traditional 2D mammography. However, the cost-effectiveness to implement the DBT modality into breast screening programmes is still under investigation. The DBT modality has been integrated into a regional breast screening program in Italy for several years. The purpose of this study is to examine the experienced Italian DBT readers’ visual search behaviour and reading efficiency.

Methods: Seven Italian radiologists, with 2-7 years of DBT screening experience, read two sets of 20 DBT test cases comprising normal, benign and malignant appearances. As well as their reporting decisions about each case, their visual search behaviour, mouse usage and response pad control were all recorded.

Results: The results showed that there was no significant difference in time between examining normal and abnormal cases. The eye movement patterns revealed that experienced DBT readers covered more areas on the 2D view and fixated longer and with more dwells in the lesion area in the 3D view. Based on these findings it is argued that by understanding the visual search patterns of experienced DBT radiologists, it could potentially help DBT trainees to develop more efficient interpretation approaches.

Conclusions: This pilot study examined several approaches to both visualize and analyze DBT interpretation behavior by experienced DBT radiologists. This finding may help DBT trainees to learn a more effective DBT reading strategy.

References:

1. Skaane, P., Bandos, A. I., Gullien, R., Eben, E. B., Ekseth, U., Haakenaasen, U., & Niklason, L. T. (2013). Comparison of digital mammography alone and digital mammography plus tomosynthesis in a population-based screening program. *Radiology*, 267(1), 47-56.
2. Ciatto, S., Houssami, N., Bernardi, D., Caumo, F., Pellegrini, M., Brunelli, S., ... & Montemuzzi, S. (2013). Integration of 3D digital mammography with tomosynthesis for population breast-cancer screening (STORM): a prospective comparison study. *The lancet oncology*, 14(7), 583-589.
3. Bernardi, D, Pellegrini, M, Valentini, M, Fanto, C, Houssami, N, The STORM II (Screening with Tomosynthesis or Mammography II) Trial: Interim Comparison of

P14 To improve the quality of Tomosynthesis images

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National Cancer Centre Singapore

Purpose/Background/Objectives: Digital breast tomosynthesis (DBT) was adopted in our institution in 2012.

The quality of DBT images performed initially was inconsistent and sometimes required repeat imaging. As there was no objective QA performed in other breast centres internationally that we were aware of, we decided to undertake this project to ensure consistent high quality diagnostic DBT studies for assessment of breast abnormality to increase detection of subtle cancers in dense breasts.

These would ensure patient safety by reducing the amount of radiation exposure by producing quality images each time. We also seek to promote a continuous learning environment among staff involved in breast assessment team.

Methods: Plan-Do-Study-Act (PDSA) methodology was used. Our team identified the causes of the low quality of tomosynthesis images with a Cause-and-effect diagram, followed by multi-voting to determine the top contributing factors, as shown in the Pareto Chart. Interventions were carried out to address the top three contributing factors.

Results: Three cycles of PDSA were carried out to address the top three contributing factors for low quality of tomosynthesis images. Before implementation, the median percentage of PG grade for tomosynthesis images was 62.55%. This was increased to a median of 82.9% after the interventions were implemented.

Conclusion: The interventions implemented by the team had been effective in improving the percentage of PG grade for tomosynthesis cases done. The results have been sustained for 6 months and the team will continue to monitor the sustainability of the interventions.

P15 Is any additional information gained regarding margins using 3d tomosynthesis vs 2d conventional digital imaging when imaging operative breast specimens? - RESULTS OF A PILOT STUDY

Jenny Waldron ; Doreen Cox ; Julie Shephard ;
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Juliet Mazarura

City Breast Screening Unit

Current Evidence: Very little work has been undertaken in this area. Currently investigation in the subject is being undertaken in the USA by Kaufman et al and Partain et al (2016).

Aim: To discover whether or not 3D tomosynthesis digital imaging provides a more accurate measurement of distance from lesion to margin in operative breast specimens than 2D digital imaging currently used.

Rationale for Study:

1) Potentially offer a more effective service to patients who have breast lesions removed by providing more accurate information on lesion to margin distances to the surgeon at the time of operation.

2) Potentially reduce the chances of a patient needing to return to theatre for a second operation to clear margins.

Methods: Experimental design using a single subject (operative specimen) imaged under both conditions was undertaken. The standard condition was 2D conventional digital imaging and the test condition was 3D tomosynthesis digital imaging.

Subjects: Ethical approval was granted for 50 participants which included all women presenting

through the breast unit who were diagnosed with breast cancer requiring surgery where the operative specimen was imaged and who consented to take part in the study.

Conclusions: Our results show that there is no definite advantage of 3D over 2D specimen imaging. It is not recommended that 3D be implemented over 2D at present, although further work could probably be done.

Further Work: Repeat study but with co-operation of histology to describe all margins that can be identified on specimen imaging. Ensure PACS storage capacity.

References:

1. Partain N, Rao M & Rao R; Intra-operative Specimen Radiograph utilizing 2D versus 3D imaging and Correlation with Final Histopathology.
2. Kaufman C, S Hill L, Zacharias K, Rogers A, Nix S, Evans E, Mahin C, Ness K & Schnell N; Visualizing the Real Difference between 2-D and 3-D specimen Mammography.

P16 Breast density and impacts on health

Cheryl Cruwys

Breast Density Matters UK

The World Health Organization states “Early detection in order to improve breast cancer outcome and survival remains the cornerstone of breast cancer control”. Breast Density Matters UK is a non-profit breast cancer organization. The organization’s mission is to educate about breast density and its screening and risk implications with the goal of achieving the earliest stage diagnosis possible for women with dense breasts. This educational mission is endorsed by breast imaging experts worldwide.

Breast density has implications for both breast screening and risk. Dense breast tissue both obscures cancers on a mammogram and is also an independent risk factor for the development of breast cancer. Whilst dense breasts are common and not abnormal, it is known that mammograms are less effective in dense breasts and supplemental screening can increase the detection of early stage breast cancer in dense breasts. Cheryl Cruwys, co-founder of Breast Density Matters UK, was diagnosed with breast cancer in May 2016. Her breast screening was conducted in France and because she has dense breast tissue, she received a supplemental ultrasound. The ultrasound detected

what the mammogram did not, an asymptomatic 8mm invasive tumour. Found early, her treatment was minimal with a positive health outcome. Incidences have been reported of women, with dense breasts, who have been diagnosed with later stage, more advanced cancers whilst having previously received 'normal' mammograms.

References:

1. Cruwys C and Pushkin J (2017) Breast density and impacts on health ecancer ed70 DOI: 10.3332/ecancer.2017 ed70.

P17 A prospective clinical audit of Digital Breast Tomosynthesis core biopsy (DBTCB) compared with Stereotactic core biopsy (SCB) within the breast screening service in South-East Wales Danielle Moakes-Evans, Joy Curran, Liz Edwards, Kate Jenkins *Breast Test Wales*

Background: Digital Breast Tomosynthesis(DBT) offers advantages over 2D digital mammography whilst addressing limitations caused by overlapping breast tissue[1]. Studies suggest an increased radiation dose associated with DBT which should be evaluated alongside potential clinical benefit[2]. DBT-guided vacuum-assisted biopsy(VAB) allows accurate tissue sampling of low contrast lesions, completed in half the time of stereotactic VAB, with fewer exposures[3].

Objective: A direct comparison of clinical performance of DBTCB with SCB to ascertain whether DBTCB results in a quicker, more effective procedure, with lower or comparable radiation dose.

Methods: Data was collected prospectively and the following recorded:

- o Time taken from first image acquisition until time of compression release.
- o Average glandular dose(AGD) from the 2D image(s) and DBT image(s).
- o Number of exposures to enable a total 2D and DBT to be inferred.

Results: 36 SCB and 278 DBTCB were included, with an additional 250 retrospective SCB for pathology analysis. The average time taken for SCB was 16

minutes and 17 minutes for DBTCB. The total average dose was 11.76mGy for SCB and 11.77mGy for DBTCB. A definitive diagnosis was achieved in 225 DBTCB's giving an 80.9% success rate compared with 29 out of 36 SCB cases, giving a success rate of 80.6%.

Conclusions: The results demonstrate DBTCB and SCB show comparable efficiencies, with no significant difference between average procedure time, average dose or accuracy of test between the two techniques. The results give a good indication for the clinical use of DBTCB as an alternative to SCB without compromising accuracy or patient outcomes.

References:

1. Peppard, H.R., Nicholson, B.E., Rochman, C.M., Merchant, J.K., Mayo, R.C. and Harvey, J.A. Digital breast tomosynthesis in the diagnostics setting: indications and clinical applications. Radiographics 2015; 35(4): 975-990.
2. Gennaro, G., Bernardi, D. and Houssami, N. Radiation dose with digital breast tomosynthesis compared to digital mammography: per-view analysis. European Radiology 2017 <https://doi.org/10.1007/s00330-17-5024-4>.
3. Pippin, F., Cimino, E., Zanelli, E., Dal Cor, A., Girometti, R., Zuiani, C., Bazzocchi, M. and Udine, I.T. Digital breast tomosynthesis-guided biopsy: preliminary experience. European Society of Radiology 2016 <https://doi.org/10.1594/ecr2016/C-2207>.

P18 Contrast enhanced breast tomosynthesis (CONTEST) in patients suspected of having breast cancer: a prospective comparison with digital mammography and breast MRI Kulsam Ali, Patsy Whelehan, Andy Evans, Sarah J. Vinnicombe *University of Dundee*

Introduction: The sensitivity of digital mammography (DM) in dense breasts may be as low as 60%1. In symptomatic practice, this causes uncertainty about the presence and extent of breast cancer, even after ultrasound, necessitating further tests such as breast MRI for treatment planning. This engenders patient anxiety, delays and additional costs. Digital breast tomosynthesis (DBT) improves visibility of morphological features, particularly spiculation, and can increase cancer detection by 20-30%2. CESM

enables detection of neovascularisation within cancers. Diagnostic accuracy of CESM appears better than DM and may rival MRI[3,4].

Here we introduce the CONTEST study, designed to assess the incremental diagnostic performance of DBT with CESM (CE-DBT) over DM for diagnosing symptomatic breast cancer, and to compare it with breast MRI and surgical pathology.

An overview of the protocol will be presented, plus tips for successfully setting up a prospective diagnostic study within a clinical service.

Study synopsis: Participants: 200 women aged 18-70 years recruited prospectively with clinical suspicion of operable breast cancer and no contraindications to CE-DBT or MRI.

Intervention: CE-DBT (followed by ultrasound and biopsy according to standard practice).

Comparator: DM (acquired in the same compression as CE-DBT)

Outcomes:

1. Comparison of incremental sensitivity and specificity between DM and CE-DBT at lesion level.
2. Comparison of performance of CE-DBT and MRI for:
 - a. variance from histological size (unifocal lesions)
 - b. detection of multifocal disease
3. Subgroup analysis: differential performance of CE-DBT and MRI by
 - a. breast density
 - b. age
 - c. level of background breast enhancement
 - d. tumour subtype (ductal versus lobular).

We aim to identify patients where CE-DBT could replace breast MRI.

References:

1. Pisano E, Hendrick R, Yaffe M et al. Diagnostic accuracy of digital versus film mammography: exploratory analysis of selected population subgroups in DMIST. *Radiology* 2008;246:376–83

2. Skaane P. Breast cancer screening with digital breast tomosynthesis. *Breast Cancer* 2016 (1);<http://doi.org/10.1007/s12282-016-0699-y>3

3. Jochelson M, Dershaw D, Sung J et al. Bilateral Contrast-enhanced Dual-Energy Digital Mammography: Feasibility and Comparison with Conventional Digital Mammography and MR Imaging in Women with Known Breast Carcinoma. *Radiology* 2013;266:743-51

4. Fallenberg E, Dromain C, Diekmann F et al. Contrast-enhanced spectral mammography versus MRI: initial results in the detection of breast cancer and assessment of tumour size. *European Radiology* 2014;24:256-64

P19 Interpreting contrast enhanced spectral mammography

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Background: Contrast enhanced spectral mammography (CESM) is a recent advance in breast imaging technology which employs intravenous injection of iodinated contrast, and relies on the angiogenesis of tumours. Increasing evidence supporting the use of CESM in the symptomatic diagnostic pathway is encouraging (1-3), with many units now considering the integration of this new technology.

CESM was introduced into our breast service in 2013. Since then, we have performed almost 400 studies, predominantly as first-line imaging for patients over 40 years old with a clinically suspicious abnormality.

Technical artefacts and benign enhancements are not uncommon with CESM, which to untrained eyes may appear alarming, suspicious of disease, or perhaps indistinct. The ability to correctly identify normal and benign features is fundamental to the reporter's performance, to ensure the appropriate diagnostic investigations are performed, or the patient is safely reassured and discharged.

Method: This pictorial review will highlight the technical artefacts and benign lesions commonly seen on CESM images.

Results: A variety of artefacts and benign lesions have been reviewed including ripple effects, rim artefacts,

cysts, breast inflammation, hamartoma, fibroadenoma and breast implant imaging.

Conclusions: CESM is becoming increasingly popular in the breast diagnostic setting; this review highlights the normal/benign features commonly encountered on CESM images.

References:

1. Tennant, S. L., James, J.J., Cornford, E.J et al Contrast-enhanced spectral mammography improves diagnostic accuracy in the symptomatic setting. Clin Radiol. 2016 Vol 71(11) pp.1148-55.
2. Fallenberg EM, Dromain C, Diekmann F, Renz DM, Amer H, Ingold-Heppner B, Neumann AU, Winzer KJ, Bick U, Hamm B, Engelken F. Contrast-enhanced spectral mammography: Does mammography provide additional clinical benefits or can some radiation exposure be avoided? Breast Cancer Research and Treatment. 2014 Jul;146(2):371–81
3. Francescone MA, Jochelson MS, Dershaw DD, Sung JS, Hughes MC, Zheng J, Moskowitz C, Morris EA. Low energy mammogram obtained in contrast-enhanced digital mammography (CEDM) is comparable to routine full-field digital

P20 The value of contrast enhanced mammography (cesm) in the assessment of lobular breast cancer

Roslyn Stanton [1], Dana Photiou [1], Ketan Jethwa [1], Yan Chen [2], Lisa Whisker [1], Sarah Tennant [1]

[1]Nottingham Breast Institute; [2]AVRC, Loughborough University, Loughborough

Background: NICE CG80 recommends MRI for local sizing of lobular breast cancers if planning breast conserving surgery. CESM has increased in availability in recent years and is now regarded as an alternative to MRI in certain circumstances. However, there is little in the current literature regarding CESM in lobular tumour subtypes, particularly whether diagnostic accuracy is comparable to MRI in this subgroup.

Method: All patients undergoing CESM between December 2013 and December 2017 in a single institution were identified from CRIS. Histopathology results for core biopsy and surgery were reviewed to

identify invasive carcinomas reported as lobular (either pure lobular or lobular features). Sizing of tumours at CESM was compared with MRI and/or final pathology size.

Results: 56 patients who underwent CESM had a core biopsy and/or final pathology reported as lobular/lobular features.

40 patients had lobular tumour/features reported at core biopsy. 24 of these had lobular tumour/features reported on final pathology, including some who had received neoadjuvant treatment. 8/40 patients who went straight to surgery had final pathology that was not lobular but ductal.

A total of 40 patients were reported to have lobular tumour/features at final pathology, including 16 not identified at core biopsy (14 Ductal, 2 C5 cytology).

26/56 patients had an MRI at a time which enabled comparison with the CESM, 35/56 had immediate surgery, 7/56 had both.

Conclusion: We present the findings and give examples of this retrospective review, comparing the accuracy of CESM for staging tumours with lobular features against MRI and final pathology.

P21 Setting up a new contrast-enhanced digital mammography (CEDM) service at Ysbyty Gwynedd Hospital in Bangor, North Wales

Kate Thomas, Andrew Gash, Karen Hopkins

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A growing body of evidence into CEDM shows that it performs better than standard mammography and that it is comparable to MRI in the detection of breast cancer [1,2]. Clinical applications of CEDM overlap with MRI, but CEDM is quicker and better tolerated [3]. Moreover, whereas access to MRI services can be limited, a relatively straightforward upgrade of existing mammography equipment can potentially allow introduction of CEDM into an existing breast service.

With patient care as our central motivation, the clinical need for CEDM was identified and the current body of evidence reviewed. By following the necessary local policies, CEDM has been introduced into our current service: a new technique using existing equipment.

Key radiological and mammography staff were involved from the inception of the service and they worked in close collaboration with the manufacturer (Fujifilm), other personnel and departments to ensure that patient safety, quality assurance and training were, and continue to be, carried out to the highest standard. In particular, there were new practical, training and patient safety considerations around the use of intravenous iodinated contrast medium. New policies, referral pathways, patient information leaflets and consent forms were developed and implemented.

We intend to audit and evaluate the new services, as well as to contribute to the research base and development of guidelines around CEDM. Looking to the future, CEDM is likely to establish itself as an integral tool in breast imaging, with scope for improving the patient experience in screening, symptomatic diagnosis and surveillance of breast cancer.

References:

1. Baltzer PAT, Kapetas P, Marino MA, Clauser P. New diagnostic tools for breast cancer. *Memo*; 2017; 10(3) 175-180.
2. Lewis TC, Patel BK, Pizzitola VJ. Navigating contrast-enhanced digital mammography. *Applied Radiology*; March 2017: 21-28.
3. Hobbs MM, Taylor DB, Buzynski S, Peake RE. Contrast-enhanced spectral mammography (CESM) and contrast enhanced MRI (CEMRI): Patient preferences and tolerance. *J Med Imaging Radiat Oncol*. 2015 Jun; 59(3):300-5.

P22 Succession planning for Consultant Radiographers - a snapshot

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Background: There are approximately currently 114 Consultant Radiographers across all specialities known to the society of radiographers. Most of which are breast. Some of these valuable posts are lost when a postholder leaves as is the case at the authors unit. This short snapshot study aims to highlight the reasons why this occurs and discusses strategies to address this.

Method: A questionnaire was sent to all current Consultant radiographers (Breast) to evaluate their experience of training to become Consultants. The time they predicted they would continue to work for,

number of Consultant and trainee posts were also recorded. The number of trainees and established Consultants at each unit was also recorded. Barriers to education education was also investigated. Suggestions were sought on streamlining this process.

A literature search was also undertaken to consider the national shortage of radiologists as this has an impact on the resulting team that delivers the service.

Results: The current cohort of Consultant radiographers have already proven the positive impact on service delivery this important role has.

The questionnaire highlighted several factors that need consideration when planning the future workforce. These include streamlining the training, identifying potential candidates and the use of trainee posts. Barriers to progression and education need to be highlighted.

Conclusion: The current shortage of radiologists has resulted in more consultancy posts for radiographers. However without succession planning which involves highlighting potential candidates and having a joined up thinking approach to their training and development the profession may lose valuable opportunities to sustain this successful role for the future.

P23 Perceptions and influences for considering breast imaging as a career option

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Introduction: There is variation in both academic and clinical radiography undergraduate exposure to mammography. This appears to influence recruitment to the specialism and the general perception of breast imaging within the radiography workforce [1]. We now explore students views on undergraduate mammography education. We also survey recently recruited breast radiographers (BRs) to find out why they chose to work in this specialism and what initially attracted them.

Method: A self-designed questionnaire containing open and closed questions was sent via Bristol on line Surveys to all 24 UK Higher Education Institutions for dissemination to female final year undergraduate radiography students. A second questionnaire was similarly disseminated to breast units targeting BRs

in post <10yrs. Responses were themed and where relevant, further explored by semi structured telephone interviews.

Results: 133 students from 19 of 24 HEIs responded, 69% aged 21-25yrs. 70% thought breast imaging suitable as a first post. >50% would consider it for the future but 90% intended taking a non-breast radiography position first. 125 BRs responded, 15% aged 21-25yrs. 31% had taken mammography as a first post, other first posts were mostly driven by vacancy and location. Both groups cited undergraduate clinical placements including in breast, as more influential than academic teaching in career decisions.

Themes emerged, particularly in the undergraduate group. These included; attitudes of other radiographers and lecturers, specialising immediately post qualification, males both as undergraduates and working in mammography, the emotional and intimate aspects of breast imaging.

Discussion/conclusion: Results and themes will be reported and implications discussed.

References:

1. Strudwick R M & Taylor K (2017) An investigation into breast imaging as part of the undergraduate (UG) education of diagnostic radiography students in the UK. *Radiography*, Vol 23. Issue 2, May 2017, p141-146.

P24 Recruitment of assistant practitioners and extending their scope of practice to alleviate workforce shortages in one NHS Trust

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Purpose: To discuss how one Trust addressed the shortage of imaging staff within mammography by recruiting Assistant Practitioners (AP's) to alleviate workforce shortages and pressures within the NHSBSP and symptomatic setting; which ultimately led to an extended scope of practice for this group of professionals.

Method: Six trainee AP's were recruited and enrolled on a SCoR accredited mammography AP course. All were trained clinically by a dedicated mammography training team. Scope of Practice for this group of staff was extended.

Results: Six AP's qualified within 12 months – dedicated and competent in all areas within their scope of practice. For the first time in 5(+) years there was no requirement to use agency staff. Round length for NHSBSP has significantly improved. Pressure in other areas, such as symptomatic and follow-up clinics, is also alleviated. Radiographers were released for specialist activities, creating a happier workforce and this hopes to improve staff retention. Reflective practice increased in radiographers as, through the assessment of quality of AP's images, this led them to question their own standards.

Conclusions: AP's are an integral and invaluable part of the imaging team in screening and symptomatic mammography. AP's complement radiographers though it is recognised that justification of requests could pose a problem in cases of staff shortages. The shortage of radiographers is considered to be a separate issue. Specialist mammography courses for AP's are not widely available, those available are expensive, and standardised training is required to ensure content and standards are maintained.

References:

1. Price, R., Miller, L., Hicks, B., and Higgs, A. (2015). The introduction, deployment and impact of Assistant Practitioners in diagnostic radiography in Scotland. *Radiography*, 21, pp. 141-145.

2. Baker, D. (2010). Designing a curriculum for the Assistant Practitioner of the future: Ensuring Interprofessional care aspects and other stakeholder requirement are met. *Radiography*, 22, pp. 161-165.

3. Lee, L., Stickland, V., Wilson, M, R, A., and Evans, A. (2003). *Fundamentals of mammography*. (2nd ED). London: Churchill Livingstone.

P25 Can radiographers report on breast MRI images - focus group findings from a single site?

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Purpose: To investigate whether the implementation of Radiographer reporting of breast MRI images could improve breast imaging service delivery and alleviate the breast imaging workforce crisis.

Background: Breast Magnetic Resonance Imaging (MRI) is an important imaging adjunct to mammography and breast ultrasound in the evaluation

of breast disease (Khoury et al 2015). In most breast imaging departments, only Radiologists interpret breast MRI images. However, there is a planned retirement of the cohort of radiologists who were newly appointed in the late 1980s. The NHSBSP now faces considerable strain due to: population increases, the age extension trial and a critical staff shortage (Jenkins 2016).

Rationale: Therefore, effective role extension, retention and the development of the existing breast imaging workforce is important in service delivery.

Method: A qualitative exploratory approach was undertaken using focus groups participants to capture the views regarding radiographers reporting on breast MRI images. Discussions from the focus group were audio-taped, transcribed and analysed using content analysis.

Conclusion: Participants concluded that with the right training and experience, radiographers have the potential to report on breast MRI at the same standard as the radiologists but this role was perceived to be only appropriate at consultant radiographer level. The reporting practitioner must have mammographic interpretation and reporting skills, and experience in other breast imaging modalities so as to be able to correlate all the radiological findings and visualize where lesions are and working in a service which had sufficient MRI breast workload to maintain competency.

References:

1. Jenkins J (2016): Workforce survey highlights strain on breast screening service. General information, NHS Breast Screening Programme. <https://phe.screening.blog.gov.uk/2016/07/18/workforce-survey-highlights-strain-on-breast-screening-service/>
2. Khoury M.E., Lalonde L, David J, Labelle M, Mesurolle B, and Trop I (2015): Breast imaging reporting and data system (BI-RADS) lexicon for breast MRI: Interobserver variability in the description and assignment of BI-RADS category. *European Journal of Radiology* Vol 84 (1)-pages 71-76
3. Mazarura J (2016): Can magnetic resonance imaging (MRI) breast reporting by advanced practitioners be of benefit within a dedicated breast unit? Weighing up the benefits. *Imaging & Therapy Practice* June 2016. Pages 17-21.

P26 Industry collaboration and research to improve mammography education: how and why?

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Purpose: The overarching aims were to improve mammography Postgraduate (PG) educational resources and embed research within teaching to improve the experience of mammography students. We established collaborations with industry to develop resources and advance our knowledge base.

Method: The project was split into strands; development of on-line resources, production of mammography live sessions and the introduction of a positioning aid. The final strand, embedding research into teaching, supported the Society of Radiographers Research Strategy 1 aims. We anticipated any outcomes would deliver direct impact with direct dissemination through social media and subsequent publication.

Results: Following a shared agreement with GE Healthcare, online resources were developed for PG education which included access to GE Healthcare system2 for students; this was utilised within a flipped learning educational package.

A live expert session was delivered through GE Healthcare Clinical Education with 111 live participants and 136 followers of the session post event. The session was shared on @WeMammographers and on LinkedIn and utilised within the current educational package of PG training.

To assist student satisfaction rates the positioning aid was developed, though collaboration with Leeds Test Objects3; a prototype developed to assist with the clinical requirements and classroom educational needs.

Conclusions: The development of industry collaborations can be very effective in supporting the development of educational resources within an educational setting. Embedding and disseminating research into educational content could allow students to progress into clinical placement with evidence based and up to date knowledge; this could subsequently enhance the future of mammography services.

References:

1. Society and College of Radiographers (2016). Society and College of Radiographers Research

Strategy [2016-2021]. London: SCoR. Available from: <https://www.sor.org/learning/document-library/research-strategy-2016-2021>

2. hls.gehealthcare.com

3. <http://www.leedstestobjects.com/>

P27 Radiography teachers/mentors and students viewpoints on challenges in mammography education and training in five European countries

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Purpose: To explore radiography teachers, mentors and students viewpoints about the challenges in mammography education faced in their daily activities.

Method: In order to shed light on their viewpoints on challenges in mammography education nowadays, a qualitative methodology was used performing two focus groups interviews, with radiography teachers/mentors (n=5) and radiography students (n=5). The content analysis applied to the interviews was based on the methodology proposed by Graneheim and Lundeman.

Results: Three main categories and thirteen subcategories were identified as challenges: [1] Building Bridges; Applying Theoretical knowledge in Practice, Performing Mammograms, Communication and Quality Assessment [2] State of the Art in Mammography; Personal Attitudes and Skills, Quality Awareness and Patient Care [3] Exploring the Curriculum; Time Constraints, Capacity in Clinical

Placement, Multidisciplinary Field and Elective Course.

Conclusions: The short study time allocated to this imaging modality and lack of material resources are the main challenges to overcome in mammography education affecting students' skills development. Breast positioning, patient communication and quality control constitute the key factors identified that can affect mammography performance, patient experience and diagnostic outcome. Consequently, those topics should be the core of mammography education for radiographers, both at basic level and Continuing Professional Development.

References:

1. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24(2):105e12.

P28 Development of flipped learning resources for mammography education

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Purpose: The aim was to educate student mammographers in the theory and practical process of radiographic quality control (QC) by delivering the learning content in a way that met their needs.

Method: An eLearning package that explained the theory of QC testing and gave practical demonstrations of each test being performed was developed. This was developed utilising collaborative design principles to inform an Industry Collaboration Zone (ICZ) ready curriculum.

Flipped learning within the curriculum was then used to actively engage students with the learning process and assessment of whether any learning had taken place was evaluated.

Results: The eLearning was rated 'very good' which was an improvement from previous feedback on classroom only based sessions. The practical demonstrations of the QC tests being performed allowed the theory to be related to practice. eLearning

offered additional benefits to the students enabling them to access materials at a time which suited them.

Conclusion: The role of the educator is to create an appropriate learning environment to engage the student¹, empowering them to become independent learners by carefully considered curriculum design, delivery and assessment². This has been achieved within our curriculum improving the quality within the education process, the clinical outcomes for the student and aims to have an overall enhancement to service delivery.

References:

1. Higgins, R., Hogg, P., & Robinson, L. (2016). Constructive alignment of a research-informed teaching activity within an undergraduate diagnostic radiography curriculum: A reflection. [Article in press]. [Accessed 22 March 2017]. Available from: <http://dx.doi.org/j.radi.2016.11.004>.
2. Marshall, G. (2008). Promoting independent learning by curriculum design and assessment in a taught postgraduate MRI programme. *Radiography*, 14, pp. 238-245.

P29 Are you working in the past? update yourself into the future. Back to the Future

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Purpose: The aim of this poster is to critically evaluate the clinical update, and to elucidate the thoughts and feelings of the participants.

Do we have the knowledge and skills to trouble shoot images and assess our work in order to improve our technique? Do we need a refresher of the standards? Are we up to date with current technologies and practices? As a clinical trainer, will an understanding of the update environment help to deliver a useful and successful training opportunity?

The high standards of image quality expected for mammography (1) and the CPD activities required for professional registration (2), remain core values for a mammographer's continued strive for improved patient care.

This activity was to identify if there are benefits to be gained from regular updates in order to improve

the quality, delivery, and provision of care to breast patients.

Method: Questionnaires were sent to mammographers undergoing updates. Results of their feedback forms and scrutiny of the update with SWOT analysis will be presented.

Conclusions: This ongoing investigation will add to our knowledge of the perceived anxieties around the update. Clinical trainers can use this information to deliver a careful, structured and successful experience for the participant.

It is anticipated that the conclusion will identify that the clinical update is a valuable tool. It could be used as part of a practitioners annual appraisal, fulfill CPD and HCPC requirements; thus contributing towards the continued provision of high quality care to breast patients.

References:

1. Public Health England. NHS Breast Screening Programme Consolidated Standards. Publications Gateway number: 2016720 Breast Screening Programme 2017.
2. The Standards of Proficiency. HCPC. Health and Care Professions Council 2013. Publication code 201303OILPOLPUB.

P30 Evaluation of the use of e-learning in the training of mammographic image interpretation: a review

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Objectives: E-Learning is a popular method of engaging students in technology based learning [1] and recent research in the psychology of education has also shown that tests are effective in enhancing student memory. [2] Whilst e-learning has become an important tool in teaching medical students and radiologists in training, there is very little evidence to suggest that it is an integral part of the training of mammographic image interpretation to non-medical healthcare professionals such as radiographers. [3] Improving the efficiency and effectiveness of specialist training in medical imaging is of vital importance given the impending shortage of specialists, [4] notably image readers in the NHS breast screening programme.

The objective of this research is to review existing literature about instructional design in medical image interpretation and identify gaps in the research which particularly relate to e-learning test sets and modules in the training of mammographic image interpretation.

Method: An appropriate review method that matches the type and extent of the data collected will be determined following completion of the literature search.

Databases; - EBSCO- host (CINAHL, MEDLINE full text, ProQuest, Science Direct, Education Source, Education-Line), Web of Science

Inclusion criteria will be those studies which include an educational intervention related to e-learning in mammographic image interpretation; we will also include training satisfaction or evaluation studies where e-learning has been evaluated.

References:

1. Choules AP (2007); The use of eLearning in medical education: a review of the current situation *Postgrad Med J*; 83:212–216
2. Baghdady, M et al (2009). The role of basic sciences in diagnostic oral radiology. *J. Dent. Educ.* 73, 1187–1193.
3. Kok EM et al (2017) What We Do and Do Not Know about Teaching Medical Image Interpretation. *Front. Psychol.* 8:309.
4. Haslerud T et al. (2017) E-Learning for medical imaging specialists: Introducing blended learning in a nuclear medicine specialist course. *Acta Radiologica Open* 6(7) 1–5 DOI: 10.1177/2058460117720858

P31 The use of 'Think Out Loud' methodology in the development of teaching materials for abbreviated breast Magnetic Resonance Imaging scan (FAST MRI) interpretation, and a comparison of the learning experience of two reader cohorts

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Background: FAST MRI has been proposed as a screening tool for breast cancer (1,2). We demonstrate how 'Think Out Loud' methodology can effectively shape training, and explore the influence of pre-existing ability to interpret breast MRI on readers' learning experience.

Method: 'Think Out Loud' methodology asks people to speak their thoughts while performing a task, to say whatever they are looking at, thinking, doing, and feeling at each moment. It helps determine expectations and identifying aspects of confusion. This was undertaken with two groups to develop training materials for FAST MRI readers.

Eight Readers, comprising 4 NHSBSP breast MRI and mammogram readers (Group 1) and 4 NHSBSP mammogram readers who did not read breast MRI (Group 2) were audio and video recorded during training. Content analysis was undertaken.

Results: Training Group 1 took a mean average of 38 minutes less than group 2 (122 and 160 minutes respectively). Group 2 asked for more clarification, of both the teaching materials and the interface with the image-manipulation software of the workstation. Members of group 2 requested additional training when unclear about software process or image interpretation.

Conclusion: Think Out Loud methodology allowed effective and efficient training across groups of image readers. The iterative nature of individual training ensured production of user-friendly support materials including frequently asked questions sheets.

Differences in time taken to train and levels of confidence achieved between the two groups have implications for the design, provision and resources needed for the group teaching of FAST MRI.

References:

1. Kuhl CK. Abbreviated breast MRI for screening women with dense breast: the EA1141 trial. *Br J Radiol.* 2017; 90: 20170441
2. Jones LI, Dunn JA, Marshall A and Kuhl CK. Mapping the drivers of overdiagnosis to potential solutions: Is the UK ready for an Imaging Biomarker Solution to the Breast Screening Debate? *BMJ* 2017 <http://www.bmj.com/content/358/bmj.j3879/rr-3>

P32 Does breast MRI aid surgical planning in the case of symptomatic breast cancer?

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Background: Breast Cancer is the commonest cause of cancer in women with one in eight being diagnosed

in their lifetime. Symptomatic breast cancers tend to be of higher grade and with more positive nodes than screen detected counterparts. MRI has a crucial role in pre-operative planning and has been found to be more accurate than mammography in determining invasive tumour size and depicting multi-site disease.

Method: We performed a retrospective study on MRIs performed at our hospital over one year for symptomatic breast cancer. MRI reports and images were reviewed, along with MDT, surgical operative notes and histology.

Results: From 1st January to 31st December 2016, 27 MRIs were performed for symptomatic breast cancer (ages 23-80 years). 9 were performed for dense mammograms, 14 for invasive lobular carcinoma, 3 for occult disease and 1 pre neo-adjuvant chemotherapy (NAC). 20 matched surgical findings, 5 did not and 2 results weren't available. Of those that did not match: 2 were under-staged, 1 was over-staged. Following the MRI 6 underwent a second look ultrasound with 5 requiring a biopsy. 1 MRI showed more disease than expected and changed surgical management from a wide-local excision to mastectomy.

Conclusion: MRI is a useful pre-operative investigation in symptomatic breast cancer and can help surgeons plan the most appropriate surgical management for the patient. Self-reflection on MRI reports and surgical histology is essential to improve image interpretation.

References:

1. Breast Cancer in Women: NHS Choices website, accessed on: <http://www.nhs.uk/conditions/breast-cancer/> (03/02/2018).
2. All Breast Cancer Report: A UK Analysis of all symptomatic and screen-detected breast cancers diagnosed in 2006, accessed on: www.ncin.org.uk/view?rid=68 (03/02/2018)

P33 MRI breast indications: a review of current practice

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Purpose: Breast MRI has been increasingly utilized as a modality to diagnose women with breast pathology.

It has been shown to be highly sensitive and cost effective in detecting pathology, however, drawbacks include the higher cost versus other modalities, and a lower specificity versus mammography in differentiating between benign and malignant breast lesions[1]. Guidelines for requesting Breast MRI have been set by the Royal College of Radiologists (RCR). This audit aims to delineate whether current practice in requesting Breast MRI in a local institution complies with current RCR Guidelines[2].

Method: We undertook a retrospective review on all breast MRI request forms on the CRIS over a period of 12 months (1st August 2016 – 30th July 2017). For each patient, we recorded the clinical indication and evaluated whether the request form was in line with current RCR guidance[2].

Results: 138 patients underwent breast MRIs within the time frame audited. Of those, 80% of the clinical request forms followed the RCR guidelines[2]. Uncompliant requests included queries regarding breast pain, nipple discharge and ductal carcinomas. 21% of all indications were for breast implant integrity.

Conclusion: 80% of all breast MRI requests were in line with RCR guidelines² over the 12 month period. A fifth of all requests were for the assessment of breast implant integrity, however, should breast MRI be the first modality for this indication? Research has shown that a negative breast ultrasound strongly supports implant integrity³, therefore MRI may not be indicated in such cases.

References:

1. Stout N, Nekhlyudov L, Li L, Malin E, Ross-Degnan D, Buist D et al. Rapid Increase in Breast Magnetic Resonance Imaging Use. *JAMA Internal Medicine*. 2014;174(1):114.
2. Royal College of Radiologists. Guidance on screening and symptomatic breast imaging, 3rd edn London, UK: The Royal College of Radiologists, 2013.
3. Juanpere S, Perez E, Huc O, Motos N, Pont J, Pedraza S. Imaging of breast implants—a pictorial review. *Insights into Imaging*. 2011;2(6):653-670.

P34 Safe working practices in vacuum-assisted magnetic resonance imaging (MRI) guided breast biopsy

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Barbara Dall

The Leeds Teaching Hospitals NHS Trust

MRI-guided breast biopsy is a useful tool in sampling lesions that are occult on mammography and ultrasound. MRI has a number of hazards that need to be controlled and an interventional procedure introduces a unique set of safety considerations. Our centre has 16 years of experience in these procedures.

MRI is a safe imaging technique but there are significant hazards which need to be controlled including a strong magnetic field that can exert significant magnetic force on ferromagnetic objects and radiofrequency fields that can cause heating of implants. Access to the MRI unit is controlled and safety is assured via screening to identify implants as MR safe, MR conditional (e.g. may be scanned under certain conditions) or MR unsafe (excluded from the scanner room). MR conditional passive and active devices are becoming more prevalent in the patient population and need to be managed safely.

Equipment can also be classed as MR safe, conditional or unsafe. Breast biopsy requires additional items of equipment (e.g. biopsy devices, scalpels, needles) to be taken into the scanner room. MR conditional equipment requires specific protocols and training to maintain the safety of patients and staff. In our centre MRI-guided biopsies and their safety are managed by a multi-disciplinary team of radiologists, radiographers, assistants and physicists. Prior to each biopsy a protocolled team briefing is carried out to identify roles and responsibilities and reiterate key safety messages. These practices enable us to provide a key service to patients whilst maintaining the highest levels of safety.

P35 Diagnostic utility of second-look US for breast lesions identified at MR imaging: Systematic review and meta-analysis

Amrita Kumar

Frimley Health

Purpose: Ongoing study with data yet to be finalised. The purpose of this study is to evaluate the use of second-look ultrasound (US) for investigating additional suspicious lesions detected on preoperative staging magnetic resonance imaging (MRI) for breast cancer.

Methods: Between December 2016 and January 2018, 250 breast MRIs were performed at our medical

institution for the evaluation of breast cancer before surgery. Second-look US was recommended for 90 patients with 88 suspicious lesions, following the MRI interpretation. The detection rate on second-look US, according to the lesion type, diameter, and histopathological outcome, were analysed.

Results: Of the 88 lesions considered in this study, 70% were diagnosed on MRI as masses and 19.8% as non-mass-like lesions. A greater number of large malignant lesions were correlated on second-look US than small benign lesions, there was no statistically significant difference according to lesion diameter or type, as seen on MRI or pathology.

Conclusion: The results of this study demonstrated variable utility of second-look US in MR imaging-detected lesions, as lesion detection rates were very heterogeneous. Subgroup analysis showed that malignant and mass lesions were more likely to be detected at second-look US.

References:

1. Spick C, Baltzer PA. Diagnostic utility of second-look US for breast lesions identified at MR imaging: systematic review and meta-analysis. *Radiology*. 2014 Nov;273(2):401-9. doi:10.1148/radiol.14140474. Epub 2014 Aug 11.

P36 Audit of "Stavros" benign lesions

Julie Smith

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- A retrospective audit of ultrasound reported lesions that had "Stavros" benign imaging features and no needle test to confirm benignity
- Cohort from young womens Breast Clinic aged 25 and under.
- Cases collected from January 2013 – December 2015 inclusive
- Reviewed 1 year afterwards

P37 A quantitative research: Correlation between age and the axillary lymph node cortical thickness (ALNCT) on ultrasound, in patients attending the symptomatic breast clinic, with no cancer or any condition resulting in reactive nodes

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Background: It is estimated that more than 40% of newly diagnosed breast cancers present with nodal metastasis (1,2). The sensitivity of ultrasound guided FNAC/biopsy ranges from 28.5 % to 55.6% (3). This variation is due in part to the prevalence of nodal metastases in the cohort of patients being studied, but also to the sampling technique being used (FNAC vs Core biopsy). There is a notable overlap in the appearance of benign/reactive and malignant nodes (4). However, the most common feature used is the cortical thickness measurement (1). Several studies have been conducted to evaluate a cut off for the ALNCT and there have been some variations in millimetres from one Centre/study to another, ranging from 2.0mm to 3.0mm (1). NHSBSP (2010) recommends a cortex >2mm.

Objectives: To identify if there is a correlation between age and ALNCT that can evaluate different normal measurement cut off in different age groups.

Method: The ALNCT of the most prominent node is measured at right angles to the plane of the margin using GE Logic E9 or Philips IU22. Data collection is complete and is being analysed using Statistical Package for Social Science version 20. 170 patients age 20 and over with U1 and U2 findings have been recruited to the study over a period of three months.

Results: The study revealed a negative correlation of ALNCT with increasing age supported by a significant 'p' value of 0.0001. Patients under 55 years of age had a 50th and 90th percentile of 2.2 and 2.9mm, respectively. In over 54 year olds, it was found to be 1.7 and 2.2mm, respectively.

Conclusion: The negative correlation of ALNCT with age is significant enough to prompt a review of the current practice of using single cut off measurement across all ages. In light of the findings, a more accurate cut off is recommended to reduce national variation in practice. It is proposed that ages may be divided into under 55 years and above. The researcher proposes a cut off of 2.6mm for under 55 and 2.2mm for over 55 year old patients.

References:

1. Net, J.M., Mirpuri, T.M., Plaza, M.J., Escobar, C.A., Whittington, E.E., Collado-Mesa, F., Yepes, M.M., (2014), 'Resident and Fellow Education Feature: US

Evaluation of Axillary Lymph Nodes', Radiographics, RSNA, Nov-Dec 2014, Vol 34, Issue 7.

2. Pazaiti, A., and Fentiman, I.S., 2011, 'Which Patients Need an Axillary Clearance After Sentinel Node Biopsy?' International Journal of Breast Cancer, Vol 2011, Article ID: 195892.

3. Ragupathy, S.K.A., (2010), 'Axillary Ultrasound Accuracy in The Symptomatic Breast Service', Clinical Radiology (RCR)

4. Whitman, G.J., Lu, T.J., Adejolu, M., Krishnamurthy, S., and Sheppard, D., (2011), 'Lymph Node Sonography', Ultrasound Clin 6 (2011) 369–380, doi: 10.1016/j.cult.2011.05.005, 1556-858

P38 Reliability of ultrasound guided FNAC in the assessment of metastatic axillary lymphadenopathy

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Background/Objectives: US with or without sampling of axillary lymph nodes is a key part of the routine assessment of suspicious breast lesions. FNAC has been used a first line sampling method at our institution although other centres use core biopsy. We looked at our FNAC results to assess its accuracy and consider factors influencing whether biopsy would be more efficient.

Method: Retrospective pathology database was used to identify all FNACs performed between January to December 2016(n=250 patients). After exclusion of non-breast cancer patients we identified 152 patients with at least one axillary FNAC. We assumed all C5(n=58) results were positive and looked at the outcome of C1-C4(n=94) using NBSS & EPR.

Results: 152 patients had first FNACs and 15/152(10%) had second FNACs. 13/152(8.5%) FNAC were C1, 7/152(5%) patients had biopsies. Axillary surgery data was available in 115/152(76%) patients, remaining 37/115(24%) patients were either receiving neoadjuvant chemotherapy, not surgical candidates or had surgery at other centres. 80/115(69.5%) patients had an abnormal axilla at surgery. 19/80(24%) patients with C2 FNAC had abnormal axilla at surgery. No patients with a B2 result had a positive axilla at surgery.

The sensitivity and negative predictive value of FNAC were 76% and 62% respectively.

Conclusion: The sensitivity and negative predictive value of FNAC in our centre is comparable to the literature [1,2] but lower than the reported sensitivity and negative predictive value of core biopsy [3]. Although the biopsy numbers in our audit were too small, it seems reasonable that if a lymph node is amenable to biopsy this should be the first method of sampling.

References:

1. Kim MJ, Park BW, Lim JB, et al. Axillary lymph node metastasis: CA-15-3 and carcinoembryonic antigen concentrations in ne-needle aspirates for preoperative diagnosis in patients with breast cancer. *Radiology* 2010;254(3):691–697.
2. Koelliker SL, Chung MA, Mainiero MB, Steinhoff MM, Cady B. Axillary lymph nodes: US-guided ne-needle aspiration for initial staging of breast cancer—correlation with primary tumor size. *Radiology* 2008;246(1):81–89.
3. Suvi Rautiainen, MD et al. Axillary lymph node Biopsy in newly Diagnosed invasive Breast cancer: Comparative Accuracy of Fine-Needle Aspiration Biopsy versus Core-Needle Biopsy¹. *Radiology*: Volume 269: Number 1—October 2013

P39 Review of imaging of breast cancers in women under the age of 30

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[1] *Penine Breast Imaging*, [2] *BTHFT*

Background: In accordance with national standard practise, our department does not routinely biopsy masses in women under the age of 25 if Stavros criteria for a benign mass is fulfilled. In a number of centres, the age limit has increased to 29. We reviewed our practise to determine if any of the cancers in this age group would have fulfilled Stavros criteria.

Method: All cases of breast cancer in women under the age of 30 between July 2006-May 2017 were identified. Digital and analogue films (reports where original imaging was destroyed) were identified and reviewed against Stavros criteria by 2 consultants.

Results: Twenty-one women were identified (age range 18-29). All patients had an ultrasound at time of presentation. All cases of cancer were identified on ultrasound and underwent image guided biopsy. Review of these images/reports confirmed that all the cancers biopsied in patients below the age of 30 fulfilled Stavros criteria. One patient had previous normal ultrasound of similar area 5 months prior to diagnosis. No other patient had any local imaging of the breast prior to diagnosis. No case was identified where previous imaged mass was reported as benign and then developed cancer.

Conclusion: Local experience supports the evidence based practise of not biopsying masses in women under the age of 25 which fulfil Stavros benign criteria. However, our findings support extending this policy to the age of 29 as all of the breast cancers in this group did not meet Stavros benign criteria and required a biopsy.

P40 Can audit driven new protocols reduce over-investigation of male breast symptoms

Diana Dalglish, Nicola Maddox, Paul Maddox

Royal United Hospital NHS Trust

Introduction: Male patients with breast symptoms are being over-investigated. In 2017 an audit in our Breast Unit identified that more than 90% of male breast imaging was unnecessary and 89% were having unhelpful blood tests. This over-investigation causes avoidable stress for patients and has significant attendant cost. We introduced a new protocol and re-audited against national guidelines.

Methods: Following introduction of the new protocol, we undertook a three-month data collection (07/07/2017–07/10/2017) to compare against our original audit (01/07/2015–30/06/2016). Prospective data was collected by our business information unit and analysed for adherence to “Best practice diagnostic guidelines for patients presenting with breast symptoms” [1]

Results: The majority of patients (both data collections) had gynecomastia/pseudogynecomastia (~80%). Two patients were diagnosed with breast cancer; both clinically suspicious prior to imaging.

Approximately one-third of blood tests (both data collections) had abnormal results but with no impact upon patients' diagnoses or management.

Conclusions: Our Breast Unit has improved its adherence to national guidelines for investigating male breast patients and reduced numbers of imaging/blood tests undertaken without compromising patient safety.

However, a significant number still undergo unnecessary investigation. Our breast clinicians have been re-educated regarding closer adherence to national guidelines. This should further reduce unnecessary imaging/blood tests without compromising accurate diagnosis and more appropriately utilise NHS resource.

References:

1. Willett AM, Michell MJ, Lee MJR, editors. Best practice diagnostic guidelines for patients presenting with breast symptoms. Produced by COI for the Department of Health . 2010 Nov. 54 p

P41 UK and BI-RADS guidelines for the management of likely benign lesions: a comparison of costs within the NHS setting
Alice Spencer [1], Helen Fielden [1], Tran Seaton [2], Sarah George [2], Neil Upadhyay [2]
[1] Imperial College London, [2] Imperial College Healthcare NHS Trust

Background: The establishment of the Image Exchange Portal (IEP) for the NHS, has simplified the process of requesting previous imaging from external institutions. The UK approach to managing likely benign breast conditions emphasises establishing a definitive diagnosis over follow up, and this will often require a core biopsy[1] . Demonstrating stable appearances on comparison with previous imaging may avoid the need for biopsy and the costs associated with the procedure.

Methods: The records for 20,108 patients over a two year period from January 2015 to January 2017 were reviewed. For all these patients, any previous imaging from external institutions was requested if the patient presented with likely benign breast pathology on imaging and no relevant previous imaging at our institution. Where possible, costs were obtained using NHS national tariff data. Where this was not possible, costs from local agreements were used.

The hypothetical costs to the commissioners were calculated.

Results: There were 97 patients with likely benign breast conditions on imaging that had previous imaging from an external institution. Previous imaging was successfully obtained in 79 (81%) patients. In 46 (47%) patients, accessing previous imaging affected the management decision by preventing the need for biopsy. The cost of the patient pathway to diagnosis is estimated to be £288 using an approach where previous external imaging is requested, compared with £450 when previous imaging is not requested.

Conclusions: Attempting to obtain external imaging results in estimated reduction of £162 (36% reduction) in the cost of patient management per outpatient.

References:

1. Maxwell AJ, Ridley NT, Rubin G, et al. The Royal College of Radiologists Breast Group breast imaging classification. Clin Radiol. 2009;64(6):624-627.

P42 Setting up in-house sentinel lymph node isotope service at the Breast Imaging unit, Midyorkshire Hospitals
Nevine Anandan ; Asha Ramakrishnan ; Amanda Coates
Midyorks Hospitals

Background: Sentinel lymph node biopsy, rather than axillary node clearance is currently the primary method to evaluate the axilla in early breast cancer as it has significantly lower morbidity and a low false-negative rate (1).

Historically, Midyorks breast patients travelled to Leeds for isotope injections. Apart from the inconvenience and higher doses, this meant an annual cost of approximately 70,000 pounds to the Trust.

We aim to set out how we created this new service on site in the Breast Imaging Unit at Mid Yorkshire Hospitals, which would be a useful guide to other units who might endeavor to do the same.

Method: Steps included obtaining an ARSAC licence, training in handling radioactive substances, spillage protocols, safe waste disposal, risk assessments, obtaining a supplier, training radiographers in preparation and injection of the isotope and getting pharmacy on board to receive deliveries of single

patient vials. The premises were subject to random inspection by the Environment Agency and Department of Health.

Results: The service was successfully implemented on July 1st 2012. The new service has saved the Trust at least 10,000 pounds annually.

Conclusion: Midyorkshire Hospitals Breast Unit now offers a comprehensive service including wire localizations and sentinel isotope injections at a single visit on the day of surgery, thereby offering patients a smoother pathway.

References:

1. Lyman GH, Giuliano AE, Somerfield MR, et al.. American Society of Clinical Oncology guideline recommendations for sentinel lymph node biopsy in early-stage breast cancer. *J Clin Oncol*2005;23(30): 7703–7720. Crossref, Medline

P43 Incidental breast findings on non-breast imaging

Edward Norman, Sheetal Sharma

Royal Liverpool & Broadgreen University Hospitals NHS Trust

Objectives: To evaluate the use of a reporting code (JBREAS) to allow timely review of incidental breast findings by specialist breast radiologists. Our secondary aim was to assess the outcome of these cases.

Methods and Materials: All reports containing the JBREAS code between 4th December 2015 and 25th September 2017 were identified from CRIS. Details of each case were then obtained using CRIS, PACS and electronic patient notes.

Results: 83 reports had a JBREAS alert code. 77 (93%) were reviewed by a breast radiologist. The mean time to review was 10 days, 75% within 14 days. Maximum time to review was 51 days.

31 patients (40%) required further assessment, but this did not occur in 6 cases (2 due to comorbidity, 4 lost to follow up). 2 had interval imaging and were subsequently discharged. 24 were seen in breast clinic. There were 7 malignant diagnoses (6 breast cancer and 1 follicular lymphoma). 19 were discharged with benign findings.

Conclusion: The JBREAS report code has proved efficient in obtaining specialist breast radiology

review. It led to a malignant diagnosis in 12% of cases where it was used. However, there were a small number of cases which were not reviewed or in which the recommendation was not actioned.

Within our department we now aim for: 100% of JBREAS alert codes to undergo specialist breast review (with an addendum added, containing an alert code if further investigation is advised) and a maximum time of 7 days from alert code to breast review.

P44 Improving turn around times in sending mammograms results to patients

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[1] Leeds Teaching Hospitals NHS Trust, [2] Harrogate District Hospital

Background: We noticed a considerable delay in patients receiving results after having follow up mammograms. Also, patients were being given radiology appointments for further investigations before receiving letter from clinicians causing much distress.

Once mammograms are performed, a radiologist issues a report, clinicians then view it, dictate and letter is sent to patient.

We audited our practice and identified causes for delay. Subsequently, we piloted a new method of issuing results and re-audited our practice.

Method: We retrospectively analysed all follow-up mammograms in the month of October 2016, looking at time taken for each part of the process. We implemented changes and re-audited the new process.

Results: The longest delays were not the mammogram getting reported but days taken for clinician to look at report and a letter being sent, this ranged from 14-28 day. After implementing changes and re-auditing, once the report was verified the majority of results letters were sent between 0-1 days to patients.

All patients recalled for further imaging received a letter and had further radiological assessment needed.

Conclusion: By piloting the process of sending result letters directly from radiology it significantly reduced the time for results letters to be sent. This reduces patient's anxiety, fewer phone calls asking for results and less duplication of work. We have been using codes

at the end of reports to flag to radiology secretaries for results letters to be sent out. 100% of the patients had a letter sent with no complaints from them.

P45 A simple, safe and cost effective mammographic recall system for breast cancer follow-up

Diane Oshada Jinadasa, Katerina Lekanidi
Brighton and Sussex University Hospitals NHS Trust

Improvements in both clinical and radiological diagnosis have led to increasing numbers of women being diagnosed at earlier stages of Breast cancer. According to the most recent published data, breast cancer is reported to have an incidence of 541.1 per 100,000 women amounting to 45,656 cases in England in 2016 [1].

This has in turn led to an increased demand on imaging services, particularly mammography in the follow-up of women treated for breast cancer. Reporting of mammograms to a high standard often by a single radiologist in a timely manner with effective mechanisms to recall patients is a challenge for any department regardless of size. In this context, local departmental processes, to streamline the reporting of mammographic examinations, initiating recalls and appointing future examinations, ideally utilising systems that are in wider use in general imaging rather than the use of tailored custom solutions become crucial to maximise productivity while minimising costs.

Our exhibit will illustrate the use of Radiology Information software programme (CRIS™, Healthcare Software Solutions) to facilitate double reporting of post treatment surveillance mammograms and those belonging to women at high risk for developing breast cancer. Routine follow-up and recall letters including appointments for future imaging episodes are subsequently generated automatically. Furthermore, this degree of automation allows for an effortless audit process which has produced significant improvements in workflow while maintaining a very high standard of care.

References:

1. Cancer registration statistics, England: first release, 2016. Office for National Statistics. <https://www.ons.gov.uk/peoplepopulationandcommunity/>

[healthandsocialcare/conditionsanddiseases/bulletins/cancerregistrationstatisticsengland/2016](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/cancerregistrationstatisticsengland/2016)

P46 An evaluation of the impact of a combined IT hardware failure and Malware cyberattack on the operational effectiveness of a large breast unit

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Purpose: To describe the challenges faced by a large breast unit during and after two major IT events. During the spring of 2017, our breast unit was affected by major PACS hardware failure followed in quick succession by a Malware cyber attack involving the hospitals IT infrastructure. This had a major impact on the provision of both screening and symptomatic services.

In this paper we will describe the main IT issues and the methods by which we mitigated against some of the practical issues. We will describe the measures taken and new working protocols undertaken to ensure safe and auditable practice. We will share our assessment of the impact of these events on patients. A few case reviews will be used to illustrate the impact on the patients and the strategies used to reduce this impact.

We will outline the audits trail that were established, and their results. and discuss the impact on patients, MDM and other pathways. There are on going issues that affect the day to day running of the service and we will describe how these manifest, including the impact on interval cancer reviews.

Conclusions: The scale of the impact of these two IT failures on the breast services, especially the screening programme is unprecedented, and we feel it is important to share the experience openly to widen the learning, open discussion and develop practical strategies if this should happen elsewhere in the NHSBSP.

P47 Effect on the screening assessment pathway of introducing specific assessment clinics offering Vacuum Assisted Biopsies

Michelle Boyce, Kathryn Taylor
Cambridge Breast Unit

Background: Vacuum Assisted Biopsies (VAB) are relatively time consuming, and often negatively affect the number of available assessment appointments, increasing the pressure on assessment clinics. We

aim to study the effect of using Advanced Practice to introduce a dedicated VAB clinic to run parallel to radiologist-led assessment appointments, with the intention of increasing the number of assessment slots - streamlining the NHSBSP screening-recall pathway, and reduce the overall appointment length.

Method: Data was collected over approximately 2 years. The initial 10 months were VABs performed in radiologist-led assessment clinic whilst the Advanced Practitioner was supervised, followed by 11 months of trialling the dedicated VAB clinic.

Times of key stages during appointments were recorded by radiographers, including patient arrival, imaging, consent, procedure duration, patient departure, report writing, and any complications e.g. fainting/bleeding. This information was recorded onto a paper template which was then documented in an excel spreadsheet by the Advanced Practitioner. No formal patient feedback was requested however, verbal feedback was documented.

The two sets of data were compared.

Results: The mean reduction in screening to assessment time was 4 days, the mean reduction in the procedural length was 8 minutes, and the mean reduction in the overall appointment length was 21 minutes. Positive verbal feedback was received regarding the efficiency of the dedicated VAB clinics.

Conclusion: Dedicated Advanced Practitioner led VAB clinics reduced screen to assessment time, also the procedure and overall appointment length. The change generated positive feedback from the team in terms of general efficiency.

P48 When is it safe for the multi-disciplinary team to accept a B1 result following screening assessment?

Sylvie Flais, Gita Ralleigh, Deborah Cunningham, Nigel Barrett

West of London Breast Screening Service

Purpose: According to Royal College of Pathology (1) and NHS Breast Screening guidelines (2) a B1 biopsy result is acceptable by the multi-disciplinary team (MDT) if concordant with the sampled lesion.

Our MDT consider a B1 biopsy concordant in the following cases:

1. Representative micro calcifications (MCCs) demonstrated on radiography of the sample.
2. US image showing needle through the lesion in the case of a mass.
3. The lesion was consistent with normal breast parenchyma e.g. hamartoma, lipoma, diffuse changes.
4. The lesion is of low suspicion (mammography/ultrasound grading 1-3)

Method: B1 results obtained between January 2015 and December 2016 were audited. Mammography and US grading, lesion type, biopsy technique, histology results and MDT decisions were obtained from NBSS and the screening records.

All imaging was reviewed to document lesion type and evidence of lesion sampling.

Results:

B1	Repeat biopsy	Early Recall	No Repeat biopsy	Total
Asymmetry	1	0	17	18
Mass well defined	6	0	19	25
Mass irregular	3	0	0	3
MCCs	7	1	3	11
Distortion	4	0	5	9
Clinical	1	0	2	3
MRI abnormality	0	0	2	2
Total	22	1	48	71

Conclusion: A B1 result is acceptable when the lesion has been adequately sampled and imaging features are consistent. We plan to review these cases at a subsequent screening round to complete our audit cycle.

References:

1. The royal college of pathologists, Guidelines for non-operative diagnostic procedures and reporting in breast cancer screening, June 2016
2. NHS Breast Screening Programme, Clinical guidance for breast cancer screening assessment, NHSBSP publication number 49, Fourth edition, November 2016

P49 Do single reader recalls make a significant contribution to cancer detection in breast screening mammography? What can we learn from reviewing these cases?

Sarah Wake, Zoe Goldthorpe, Anne Ratsey, Sarah Perrin

Taunton and Somerset NHS Trust

Background: The objective of independent double reading in breast screening mammography is to detect a greater number of cancers by reducing perceptual error. With a current workforce crisis in breast radiology, the efficiency of this method has been questioned. The purpose of this review was to determine if single reader recall cancers in the NHS breast screening programme are significant, and whether these cancers show trends in their mammographic characteristics.

Method: All single reader recalls that were assessed and diagnosed as cancer from January 2012 to January 2018 were included. A retrospective review of the NBSS data, screening mammograms and final pathological reports was performed.

Results: 144 women, 14% of all screen detected cancers, were attributed to a single reader recall throughout 2012-2018. These cancers were pathologically significant; 48% were invasive Grade 2 or 3, and the average final size was 20mm.

83% of lesions were observed only by the second reader. The majority were mammographic masses occurring in breasts with scattered fibroglandular density (60% BIRADS B). In 38% the cancers were sited medially. 24% were visible only on a single mammographic view, most often the cc projection.

Conclusions: Single reader recalls contribute to a significant proportion of the cancers detected through breast screening mammography, and it remains important to continue with double reading despite workforce issues. The results demonstrate human perceptual errors inevitably occur during the first read. Film readers should be mindful of overlooking single view lesions and those sited in the medial aspect of the breast.

P50 Population register accuracy and completeness as a tool to improve screening coverage

Patricia Fitzpatrick, Simon O'Connor, Derek Ross ;

Linda Wilson, Margaret Sweeney, Therese Mooney
National Screening Service, Ireland

Newcastle is the first unit in the UK to offer radioiodine The National Screening Service in the Republic of Ireland encompasses both breast and cervical screening. Women aged 50-60 are invited to both. The programmes differ in that women are given a distinct appointment at a breast screening centre or mobile, whereas women are invited to make an appointment for cervical screening at one of over 4,500 registered smertakers nationwide. The aim of this study was to increase the proportion of women aged 50-60 who attend both programmes through improved identification.

In Ireland a unique health identifier is being introduced but currently does not exist. There are separate registers for the national population screening programmes in Ireland. The cervical and breast screening registers were compared for numbers of women captured by the register for each programme.

There were 310,459 unique eligible women on the breast screening register and 333,582 women on the cervical screening register. Of these 294,754 were on both registers, 15,705 were on the breast screening register only and 30,098 on the cervical register only.

These are dynamic registers, with this analysis taken on a snapshot at a single timepoint. However there is opportunity to co-promote screening programmes and utilise known eligible women on cervical screening register to ensure identification of the full target population for breast screening and vice versa. This cross comparison has improved completeness and accuracy of both registers. A procedure is being introduced whereby when a woman uses the web-registration function of one programme she is directed to the web-registration page of the alternate programme.

P51 Assessment of well defined lesions in prevalent screening

Rupinder Rai, Humaria Khan, Julie Shephard, Amy Wilibraham, Ed Goble, Doreen Cox, Joyce Yates, Jenny Waldron, Louise Tromans, Julie Smith
Sandwell and West Birmingham Hospital

Purpose/Background/Objectives: It is not uncommon to find well defined masses on prevalent screening mammograms. However, there is a potential

risk for over calling well-defined lesions, resulting in increasing workloads within the department and also potential long term psychosocial harm to the client. The aim is to review the prevalent mammograms with well-defined masses, review any consensus outcomes and to assess the outcomes of these lesions when recalled.

Method: Our local NBSS (National Breast Screening service) database was reviewed to identify clients who were recalled back for well-defined masses detected on prevalent screen. This was a retrospective audit of 6 months between October 2016 and March 2017. All age groups were included. Mammograms, histology results and outcomes of recall were reviewed.

Results: There were 68 recalls with well-defined masses. Majority of clients were aged between 45 - 54 years. 26% of these were consensus agreed recalls. 83% of the well-defined lesions were described as masses or cysts. Lesion sizes ranged from 4 to 54 mm, with the average size being 10mm. Of those lesions that were biopsied, 80% were found to be fibroadenomas. No malignant lesions were identified in this cohort. All 68 recalls were discharged as routine recalls.

Conclusion: Overall, recall rate in prevalent screening mammogram meets the standards set of <10%. [1] However, all the recalls were eventually found to be benign, commonly fibroadenomas. There is further scope to reduce the recall rates in prevalent screening mammograms and in turn reduce work load and patient anxieties.

References:

1. Public Health England. [Internet] Breast Screening consolidated standards April 2017. www.gov.uk. [cited 2017, August]. Available from: <https://www.gov.uk/government/publications/breast-screening-consolidated-programme-standards>
2. Crowther et al. [Internet] Audit of high prevalent breast screening recall rates: Torbay Hospital. Breast Cancer Research, November 2015. [cited 2015, Nov 5th]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4670150/>

P52 Does national advertising encourage younger women to participate in breast screening for the first time?

Lorraine Fahy ; Therese Mooney ; Patricia

Fitzpatrick

National Screening Service, Ireland

National advertising promoting attendance at the Irish breast screening programme consists of two 8-12-week advertising periods annually, with bursts of radio, press, TV, out-of-home and digital advertising. Once a woman attends screening she is likely to re-attend. Uptake in new initial women is highest amongst younger women (aged 50 to 54) invited for the first time. This rose from 72.3% to 74.9% between 2012/13 and 2015/16. However, in 2016/17 uptake fell to 71.8%. The aim of this study was to determine the effect of national advertising on screening participation among initial 50-54-year-olds.

Screening activity was combined with advertising schedules for 2016 and 2017. Z-tests were used to compare screening participation during and outside advertising periods. Uptake metrics separate “new initial” women from initial women who have not responded to a previous invitation. However, participation metrics cannot distinguish between these types of women and give an overall initial participation rate, diluted by the non-responders. Screening promotion activity was reviewed.

In 2016 and 2017 screening participation was significantly higher during compared with outside advertising periods (2016 62.4% vs 58.2%, $p < 0.0001$; 2017 58.9% vs 54.9%, $p < 0.0001$). Staff shortages meant that screening promotion activity was reduced to 65% in 2016 and early 2017.

The impact of national advertising on screening participation was positive in 2016 and 2017. However, overall rates fell. The reduction in screening promotion activity may have contributed to the decline but is difficult to measure. National advertising is successful in increasing participation in first time screening.

P53 Role of predicted histology at assessment prior to MDT

Melanie Schofield

South Lancashire Breast Screening Program

Aim: Is there a role of stating predicted histology on the assessment letter which is available for the pathologist and at the MDT?

Method:

- Review correlation of predicted histology given on the letter generated at Assessment clinic, which is also given on the Histology request form and correlate the accuracy with the final histology at MDT.
- Review all cases from a regular assessment clinic from May16 to Jan18.
- Review includes accuracy of predicted histology, mammographic and U/S grade and type of lesions biopsied.

Results:

- Overall results showed good correlation between predicted and final histology.
- Examples are used if there was a discrepancy and whether histology was upgraded or downgraded.

Conclusion:

- Predicted histology supports decision at MDT.
- Particularly useful if the assessing radiologist is not present at MDT.
- Important when actual histology is less than predicted histology and highlights if a repeat biopsy is required.
- Potentially reduces error and avoids underdiagnosing malignancy.

P54 Analysis of the ethnic make up of a metropolitan breast screening service and incidence of cancer within each ethnic group
Aisha Naseer, Linda Metaxa, Connie Horth, Jezreel Naidoo, Tamara Suaris
St Bartholomew's Hospital, London

Objectives: To analyse the ethnic groups in a metropolitan breast screening service and assess if cancers were proportional in the ethnic groups.

Methods: 3 years screening results were analysed according to ethnic origin submitted with screening questionnaires. The BASO data for these 3 years was analysed. Chi-squared statistical analysis was performed.

Results: Of 141,000 women screened over 3 years, 57% were White British/ Irish and other white backgrounds. 5% of women were Bangladeshi, from a large proportion of Asian backgrounds accounting for 15% of all women screened. The numbers of

cancers seen in each ethnic group is approximately proportionate to the number of women screened in that ethnic group. When grouped into broader ethnic groups, such as Asians, Blacks, White, White British including all the subtypes, we found that there is statistical significance difference in the incidence of breast cancer between them, with higher incidence in the White British group (pvalue 0.04).

Conclusions: Cancers in our metropolitan breast screening service are approximately proportionate to the numbers of women screened in each ethnic group. However there are statistically significant differences in the number of cancers expected in these compared with the observed, with a higher incidence in the White British ethnic group.

Further analysis is required to (i) assess differences in the biological characteristics of cancers seen in each ethnic groups, (ii) identify the ethnicity of those women who did not attend screening, as this may bias the results seen, (iii) ascertain complete dataset of symptomatic cancers also affecting this catchment over the same timeperiod would confirm cancer incidence.

P55 Subtle interval arbitration cancers: An audit and pictorial case review
Sue Garnett
Coventry

Background: Mammography arbitration is a method for reducing the number of benign/normal recalls to assessment, whilst detecting small cancers. It has evolved from single reader arbitration to panel consensus review[1]. Arbitration cancers have been perceived by one of two readers and can be considered having borderline or subtle signs[2].

Purposes: This pictorial review highlights a number of interesting cases of vague or misleading appearances resulting in a normal report.

Method: A large breast screening unit's collated data of all third read interval cancers for the time period 1st March 1991-30th April 2017. After exclusions were made, the mammographic appearances of these cases were recorded; descriptive results and typical cases are presented. A pictorial review of the most interesting mammographic appearances will be presented.

Results and Conclusions: The main findings are:

- A lesion can be more prominent on one view
- Seventy percent of cases were detected by the first reader
- Previous images were persuasive that there was little change in mammographic appearance.

Although this is a small subset it could provide useful cases for PerForms. A system could be used in the NBSS reporting system to alert the reader to any previous arbitration.

References:

1. Jenkins J, Murphy A E, Edmondson-Jones M, Sibbering D M, Turnbull A E. (2014) Film reading in the East Midlands Breast Screening Programme – Are we missing opportunities for earlier diagnosis? *Clinical Radiology*. 69: 385-390.
2. Caumo F, Brunelli S, Tosi E, Teggi S, Bovo C, Bonavina G, Ciatto S. (2011) On the role of arbitration of discordant double readings of screening mammography: Experience from two Italian programmes. (*La Radiologia Medica*) 116:84-91.

P56 Requesting previous external imaging for patients with likely benign breast conditions: what are the effects on the cost of patient management?
 Neil Upadhyay [1], Helen Fielden [2], Alice Spencer [2], Siham Sudderuddin [1]

[1] *Imperial College Healthcare NHS Trust*, [2] *Imperial College London*

Background: The establishment of the Image Exchange Portal (IEP) for the NHS, has simplified the process of requesting previous imaging from external institutions. The UK approach to managing likely benign breast conditions emphasises establishing a definitive diagnosis over follow up, and this will often require a core biopsy¹. Demonstrating stable appearances on comparison with previous imaging may avoid the need for biopsy and the costs associated with the procedure.

Methods: The records for 20,108 patients over a two year period from January 2015 to January 2017 were reviewed. For all these patients, any previous imaging from external institutions was requested if the patient presented with likely benign breast pathology on imaging and no relevant previous imaging at our institution. Where possible, costs were obtained

using NHS national tariff data. Where this was not possible, costs from local agreements were used. The hypothetical costs to the commissioners were calculated.

Results: There were 97 patients with likely benign breast conditions on imaging that had previous imaging from an external institution. Previous imaging was successfully obtained in 79 (81%) patients. In 46 (47%) patients, accessing previous imaging affected the management decision by preventing the need for biopsy. The cost of the patient pathway to diagnosis is estimated to be £288 using an approach where previous external imaging is requested, compared with £450 when previous imaging is not requested.

Conclusion: Attempting to obtain external imaging results in estimated reduction of £162 (36% reduction) in the cost of patient management per outpatient.

References:

1. Maxwell AJ, Ridley NT, Rubin G, et al. The Royal College of Radiologists Breast Group breast imaging classification. *Clin Radiol*. 2009;64(6):624-627.

P58 Local factors influencing attendance for breast cancer screening in the prevalent round: a service review

Leah Richardson, Shazia Khan
Penine Breast Screening

Background: Many breast screening units struggle to meet the breast screening uptake minimum standard of 70%, particularly in the prevalent round. The aim of the service review was to identify the factors affecting uptake in the prevalent round.

Method: A semi-structured questionnaire with both open and closed questions was used to collect data from participants attending for breast cancer screening in the prevalent round at a specified location.

Results: The response rate was high at 99%. A descriptive analysis of the results was undertaken and a thematic analysis of the qualitative data generated from open questioning was completed. The results demonstrated that having an experience of breast cancer (either personal/relative or friend) and convenience of appointment time and location were influencing factors for attendance.

Conclusions: The factors affecting attendance in the prevalent round appear to agree with current research findings around attendance for breast cancer screening across both prevalent and incident rounds.

The results will enable the screening unit to appropriately target strategies to increase screening uptake in the prevalent round.

P59 Audit to establish cancer detection rates for the 5 - 11yr surveillance group in Dorset

Lisa Bisset, Nicola Robson, Stella Campbell

Poole Hospital NHS Foundation Trust

Patients diagnosed with and treated for breast cancer are typically followed up for 5 years, with clinical review and annual mammography, then discharged. Currently, the Dorset Cancer Partnership Breast Service Steering Group (SSG) is to continue to offer Surveillance mammography on an 18 monthly basis until the patient is 11 years post op.

NICE Guidelines are as follows:

- Offer annual mammography to all patients with early breast cancer, including DCIS, until they enter the NHSBSP/BTWSP. Patients diagnosed with early breast cancer that are already eligible for screening should have annual mammography for 5 years.
- On reaching the NHSBSP/BTWSP screening age or after 5 years of annual mammography follow up, the screening frequency should be stratified in line with patient risk.

According to the Royal College of Radiologists women who undergo breast conserving surgery are at long term risk of recurrence, and recurrences detected by mammography have better survival than those identified clinically. The RCR does not provide recommendation for frequency of follow up mammography after 5 years post operatively.

The objective of this audit was to establish the number of new cancers/recurrences diagnosed by surveillance mammography and compare with recommended targets of the NHSBSP.

All surveillance examinations, performed between Jan 2013 and March 2016, were reviewed:

- 1607 women underwent surveillance mammography.
- 120 were assessed further

- Cancer detection rates:

- o 14.3 per 1000 with invasive (NHSBSP target >4.1 per 1000)

- o 6.22 per 1000 with in situ disease (NHSBSP target >0.6 per 1000)

As the audit demonstrated the relatively high cancer detection rates, the SSG concluded that surveillance mammography continues to be valuable.

References:

1. National Institute for Healthcare Excellence (2009) 'Early and locally advanced breast cancer: diagnosis and treatment'. Clinical Guideline [CG80]. February. Available at: <https://www.nice.org.uk/guidance/cg80/chapter/1-guidance#follow-up> (Accessed 11/10/16)
2. Wilson R. and Liston. J (eds) (2011) Quality Assurance Guidelines for Breast Cancer Screening Radiology. NHSBSP Publication No 59. March. Sheffield: NHS Cancer Screening Programmes.
3. The Royal College of Radiologists. (No date) 'Guidance on screening and symptomatic breast imaging'. Third edition. Clinical Radiology. Available at: https://www.rcr.ac.uk/system/files/publication/field_publication_files/BFCR%2813%295_breast.pdf (Accessed 11/10/16)

P60 Measuring women's experiences of mammography: development and validation of new methods, using the Rasch measurement framework

Patsy Whelehan [1], Maria Pampaka [2], Andy Evans [3], Gozde Ozakinci [4]

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Introduction: The few existing mammography experience measures have various limitations, for instance lack of detail on the examination itself. We therefore aimed to develop and test new measures using a "modern psychometric" approach, in particular the Rasch measurement framework[1].

Methods: Sixty-nine survey items concerning the mammography experience and potential contributing factors – including image-based mammographic technique factors - were generated from existing

literature, expert opinion, and our previous qualitative study[2]. Questionnaires and data forms were reviewed by stakeholders to provide evidence of acceptability and face- and content-validity. Items were mostly fixed-response on a 0-10 scale. Free-text data were also collected (reported separately). The questionnaires were piloted in women attending for breast screening.

Rasch analysis provides evidence for validity of measures through item fit statistics (construct unidimensionality) and Differential Item Functioning (assessing invariance between participant groups).

Results: The first pilot included 237 participants (52% participation rate). Preliminary Rasch analysis showed scaling problems such as overuse of extreme categories. In the dimension intended to quantify overall positive/negative examination perceptions, findings included item redundancy between discomfort and pain, and unidimensionality between pain and anxiety. We revised the questionnaires and conducted a second pilot, recruiting 101 participants.

Conclusion: Full results of the Rasch analysis will be ready for presentation, along with results of regression modelling to identify predictors of better/worse mammography experiences. We believe this is the first example of Rasch measurement in radiography research. Other researchers investigating areas such as patient experience or professional attitudes may find this approach worthy of consideration.

References:

1. Bond T, Fox C. Applying the Rasch Model: fundamental measurement in the human sciences. 3rd ed. Hove (UK): Routledge; 2015.
2. Reference withheld for blind review.

P61 A mammographers' perception of patient assisted-compression

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Rationale: Mammography has a well-documented perception with pain and discomfort, evidence suggests this association may deter subsequent breast imaging. Attendance is imperative for the success of the NHS Breast Screening Programme and symptomatic services to reduce breast cancer mortality[1].

Measures to reduce fear and distress of having a mammogram are continually being addressed. For post -surgical women the discomfort can be increased due to the sensitivity of breast tissue. Breast density can also be linked to pain on compression which can also increase the anxiety of the mammogram procedure.

With these factors apparent an innovative patient-assisted compression (PAC) device was implemented. PAC enables the woman to finalise the amount of compression once the mammographer has positioned and applied minimal compression using a hand-held tool. It is the belief that this new concept could improve patient experience and minimise any pain suffered during a mammogram. The purpose of this evaluation is to identify mammographers' perception and acceptance of patient-assisted compression.

Method: Mammographers completed a questionnaire to establish their current knowledge and unbiased perception of the technology. Training was provided and PAC was offered to 100+ women from symptomatic and post-surgery services. The data was collected and documented for review. The intention to undertake a second questionnaire to re- address the points identified in the first questionnaire to ascertain if perceptions had in any way changed.

Results: Data collection is ongoing. Due to the qualitative information the findings will be presented in the appropriate format.

References:

1. Whelehan, P. Evans, A. Wells, M. MacGillivray, S. The effect of mammography pain on repeat participation in breast cancer screening: a systemic review. The Breast 22 (2013) 389-394.

P63 Is there an improvement of patient's experience during a mammogram with the addition of a 'Sensory Suite'?

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Background: Despite the 99% survival rate from early detection of localised breast cancer, patients are reluctant to undergo mammography due to the level of pain experienced. [1] Research has investigated the physical causes of pain during mammograms, however the psychological effect from previous mammograms is an important factor. [2] The quality of care the

patient receives during a mammogram helps reduce anxiety and therefore reduce the level of pain. [1]

Aside from using physical pain reduction techniques, previous studies have investigated the patient's anxiety levels whilst listening to relaxing music. Music therapy is defined as 'the controlled use of music, its elements and their influences on individuals to aid in the physiological, psychological and emotional integration of the individual during treatment'. [3] This has proved successful in patients undergoing mammographic procedures, as research has shown that music reduces anxiety and pain. [4]

Aim: The aim of the study is to analyse how patients who have previously had mammograms compare their experiences with and without the sensory suite; and whether the sounds and graphics help reduce anxieties and discomfort.

Method: A prospective qualitative study will be conducted to provide an understanding of the patient's experience. Non-random purposive sampling will be used. Patients will be excluded if this is their first mammogram. If consent is given, they will be presented with a questionnaire; each question answered Y/N and then rated from 1-5. Additionally one open question will be included to allow for additional comments. Analysis will be concurrent with data collection.

References:

1. Mendat CC, Mislán D. Patient comfort from the technologist perspective: factors to consider in mammographic imaging. *International Journal of Womens Health* 2017; 9: 359-364
2. Rutter DR, Calnan M, Vaile MS, Field S, Wade KA. Discomfort and pain during mammography: description, prediction, and prevention. *British Medical Journal*. 1992; 305(6851):443-5
3. Munro S, Mount B. Music therapy in palliative care. *Canadian Medical Association Journal*. 1978; 119(9), 1029-1034
4. Soo MS, Jarosz JA, Wren AA, Soo AE, Mowery YM, Johnson KS, Yoon SC, Kim C, Hwang ES, Keefe FJ, Shelby RA. Imaging-Guided Core-Needle Breast Biopsy: Impact of Meditation and Music Interventions on

P64 A comparative, observational study of pain experienced during successive mammography events between family history and post-operative patients

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Purpose: To measure and evaluate mammography-related pain in follow up (FU) and family history (FH) patients undergoing regular surveillance as a potential baseline for future care and to evaluate any prolonged effects.

Methods: Two hundred women (mean 54; range 32-84 years), were invited to participate by written invitation. 100 subjects had a FH of breast cancer and 100 had undergone conservative treatment for breast cancer (FU) but were currently asymptomatic. A questionnaire invited the subjects to score pain before compression based on prior experiences, immediately after mammographic compression and one week later using a validated pain scale. Data collection included bra cup size, compression force, breast density and practitioner. Data on adverse events relating to compression i.e. skin tearing were also collected.

Results: There was strong correlation ($r=0.79$, $P<0.001$) between previous pain scores and current pain scores, but no significant correlation between bra cup size, breast density or compression force ($P>0.05$). Pain scores improved slightly between previous and current examinations for all the mammographers and there was consistency in average pain scores but variations in the compression forces applied. Approximately 8% experienced no pain, 30% low pain, 50 % moderate pain and 15% severe pain. 1.5% of patients experienced severe prolonged pain and 2% reported skin tearing.

Conclusion: Data from patient experience is essential to improve future pain outcomes. There are physical side effects from mammography that affect patient experience.

P65 Metastatic tumours to the breast. A pictorial review of the mammographic and sonographic findings

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Metastatic spread to the breast from other solid organs is rare with a reported incidence of 0.2 to 1.3% of all breast malignancies¹. In most instances secondary involvement of the breast is part of widely disseminated metastatic disease that occurs late in the course of primary disease. But, it may be the first manifestation of malignant disease, or the first site of metastatic disease from a known primary.

Metastases to the breast can arise from any extra-mammary solid primary, but the most common sources are melanoma, lung, ovary and gastrointestinal carcinoma^[1].

Lesions are much more likely to be multiple or bilateral than primary breast cancers, and they develop in the subcutaneous fat, rather than deeper glandular tissue^[2]. On mammography metastases usually appear as well demarcated, dense for size masses, without calcification^[1]. They can mimic both benign lesions, such as fibroadenoma, and malignant breast lesions such as high grade, mucinous and papillary carcinoma.

On ultrasound, most metastases appear well circumscribed, hypoechoic, and have normal or enhanced through-transmission^[3]. Due to their high cellularity and rapid growth, deposits lack desmoplastic reaction and are prone to central ischaemia and necrosis, typically demonstrated by a central hypoechoic core³. Colour doppler interrogation most often shows increased vascularity.

Thus, when interpreting breast imaging, it is important to be aware of the patient's medical history as metastatic tumours differ in appearance to primary breast cancers. We depict this through the imaging of several cases that have presented recently to the symptomatic breast service.

References:

1. Lee S, Park J, Kook S, Han B, Moon W. Metastatic tumors to the breast: mammographic and ultrasonographic findings. *Journal of Ultrasound in Medicine*. 2000;19(4):257-262.
2. Dilaveri C, Mac Bride, Sandhu, Neal, Ghosh, Wahner-Roedler D. Breast manifestations of systemic diseases. *International Journal of Women's Health*. 2012;;35.
3. Stavros A, Rapp C, Parker S. *Breast Ultrasound*. Philadelphia: Wolters Kluwer; 2015

P66 Gentamicin impregnated bead particles mimicking microcalcification

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Background: We present a case of gentamicin impregnated polymethylmethacrylate (PMMA) beads, used to treat a post-operative breast infection, producing particles mimicking recurrent breast cancer. To our knowledge, this has not been previously reported in the literature.

Case presentation: A 58-year-old woman with a screen detected 18mm grade 2 invasive ductal carcinoma underwent wide local excision and sentinel lymph node biopsy. She experienced persistent post-operative oozing and developed a wound infection that did not improve with oral antibiotics. Treatment of the infection required drainage, re-suturing and the insertion of gentamicin impregnated PMMA beads into the excision cavity.

Her 1-year bilateral surveillance mammograms identified new areas of fine microcalcification surrounding the gentamicin beads at the resection site. This was initially thought to either represent new disease or calcification from chronic inflammation and therefore a vacuum assisted biopsy was performed (12 x 9-gauge cores) with representative samples of presumed microcalcification present. Histological examination identified scattered brownish black material that was non-refractile on polarisation with surrounding giant cell reaction but no microcalcification. The impression was that this likely represented implant material from the gentamicin beads.

Conclusion: This case illustrates the potential for gentamicin impregnated PMMA beads to produce particles that can mimic microcalcification in the breast leading to diagnostic uncertainty on surveillance mammograms. Imaging in this patient group suggestive of new microcalcification should therefore be interpreted with caution.

P67 Mimics of metastatic breast cancer on CT Pearls and pitfalls of Interpretation with radiological and pathologic correlation

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Here we present, in the form of a pictorial review, a case selection derived from several years of our departmental metastatic breast cancer MDT with particular emphasis on those lesions found on CT which can mimic or be mistaken for breast cancer metastases.

The main teaching points are:

1. To review and emphasise multisystem pathology that may mimic metastatic breast cancer on CT with radiological and pathological correlation.
2. To demonstrate pearls and pitfalls of imaging interpretation in the identification of pathology that may mimic metastatic breast cancer.
3. To teach specific radiologic signs useful in the differentiation between benign mimics, alternative primary malignancy and metastatic disease.
4. A problem solving imaging approach to the characterization of benign mimics, alternative primary malignancy and metastatic disease in indeterminate cases including interval radiologic follow up, employing other imaging modalities including PET-CT and MRI and imaged guided core needle biopsy.

P68 Case report: Nipple malignant-type calcification

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Nipple malignant-type calcification is a rare lesion, with only 2 cases reported in literature. We present a case of a 48 year-old female who come to us because of non-cycle breast pain, where nipple malignant-type calcification was incidentally seen on mammography. A wedge excision of the nipple was performed to diagnose. The final pathology is fibrocystic change with benign calcium in connective tissue

References:

1. Cooper, Richard. A and David. B Eilers. Mammographic Findings in Basal Cell Carcinoma of the Male Nipple. AJR 2000; 175: 1065-1066
2. Kopans, Daniel B. Breast Anatomy and Basic Histology, Physiology, and Pathology. Breast Imaging: Lippincott William & Wilkins. 2007: 8-45.

3. Laszló Tabár, Peter B. Dean. Calcifications. Teaching Atlas of Mammography. 2001: 149-273.

4. Laszló Tabár, Peter B. Dean. Finding Breast Cancer When It Is Still Small: Rationale and Scientific Evidence. Breast Cancer The Art and Science of Early Detection with Mammography: Thieme. 2005.

5. Richard, Glenn. Nipple Calcification [Internet]. Retrieved July 03, 2004. Available from: http://rad.usuhs.edu/medpix/master.php3?mode=topic_images&recnum=5543&quiz=#top.

P69 Breast implant associated anaplastic large cell lymphoma (BIA-ALCL) -- Experience of a single tertiary centre

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Background: BIA-ALCL is rare non-Hodgkins lymphoma occurring in breast implant capsules, given its designation by WHO 2016¹ with estimated incidence of 1-3/1,000,000/year² and average presentation 10 years after insertion³. We aim to overview BIA-ALCL cases referred to / treated at our hospital.

Method: Retrospective case studies.

Results: N=7 women (12 implants) : 3 bilateral cosmetic augmentations, 2 unilateral and 1 bilateral implant reconstructions after mastectomies for breast cancer treatment and 1 bilateral implant reconstruction after risk reducing mastectomies. Average time between implant insertion and diagnosis was 9 years (3-16yrs). 4 presented with delayed seromas, 2 recurrent capsular contractures and 1 palpable lump. 2 diagnosed after capsulectomy. 5 diagnosed preoperatively: 4 seromas aspirated: atypical / malignant cells seen on cytology, BIAL confirmed on cell block (CD30+, ALK-) and one lump biopsied. 6 had ALCL and 1 diffuse large B Cell Lymphoma (DLBCL). All underwent PET scans, none showed distant disease. CT/MRI in some, did not alter diagnosis / management. 5 diagnosed with stage I (capsule confined) and 2 with stage 2 disease³, 4. All underwent surgery to excise capsules, remove implants. 3 also received chemotherapy.

Discussion: BIA-ALCL is rare, requires high index of suspicion in any women with longstanding implants with breast related signs/symptoms. Breast USG + cytology are usually diagnostic. PET/CT helps exclude distant disease. Stage I disease can be managed with surgery alone.

Conclusions: Important for physicians involved in care of patients with breast implants to be aware of BIA-ALCL to recognize initial symptoms.

References:

1. Swerdlow SH, Campo E, Pileri SA, et al. The 2016 revision of the World Health Organization classification of lymphoid neoplasms. *Blood*. 2016;127(20):2375-2390.
2. Doren EL, Miranda RN, Selber JC et al. United States Epidemiology of BIA-ALCL. *Plast Reconstr Surg*. 139(5): 2017
3. Johnson L, O'Donoghue JM, McLean N et al. BIA - ALCL : The UK experience. Recommendations on its management and implications for informed consent. *European Journal of surgical oncology*. August 2017. Volume 43, Issue 8, Pages 1393-1401.
4. Clemens M W, Horwitz S M. NCCN Consensus Guidelines for the Diagnosis and Management of BIA-ALCL. *Aesthetic Surgery Journal* 2017, Vol 37(3) 285–289

P70 Imaging features of invasive lobular breast cancer and it's correlation with histopathology: A pictorial review for a challenging diagnostic entity

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Imaging plays a crucial role in the detection and staging of breast cancer to facilitate vital treatment strategies. The epidemiological, clinical and pathological differences between invasive lobular carcinoma and the more common invasive ductal carcinoma are well described in the literature. Lobular breast cancer is well-known for its heterogeneous elusive nature and has been postulated to produce little desmoplastic reaction with minimal architectural distortion.¹ Occult and equivocal mammographic and sonographic findings are often common,

hence posing a real diagnostic challenge. The low mammographic sensitivity has prompted the use of additional imaging modalities such as tomosynthesis, MRI and contrast enhanced mammography. It has also been hypothesised that axillary nodal metastases may equally pose a diagnostic challenge in invasive lobular carcinoma limiting the accuracy of preoperative ultrasound guided axillary staging.

We present a series of cases correlating mammographic and sonographic imaging of the breast and axilla with subsequent MRI and histology findings. Selected cases where additional tomosynthesis views are available will also be compared. Patients referred via symptomatic and screening pathways over the last 3 years with invasive lobular carcinoma at our institution are reviewed and presented. Series of cases of various tumour grade and stage will be highlighted comparing the different modalities exhibiting the vast unpredictable imaging features within the breast and axilla.

References:

1. Arpino G, Bardou VJ, Clark GM, et al. Infiltrating lobular carcinoma of the breast: tumour characteristics and clinical outcome. *Breast Cancer Res* 2004;6: 149-56.

P71 Evaluating the Eklund - recent cases of malignancy illustrating the importance of this additional view of the augmented breast

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Background: It is recognised that mammography is less effective in women with augmented breasts due to the fact that the implant obscures some of the breast tissue. In our breast unit we have always used the Eklund view; this is where the radiographer gently manipulates the breast tissue away from the implant and pushes the implant back, also known as the push back view. This helps to demonstrate more of the breast tissue and therefore aids diagnosis.

A national audit of breast screening units identified variation in the techniques used and this led to the NHS BSP publishing new national guidance on screening women with implants in April 2017, with an update in July 2017. The publication states that it is now mandatory for all women, following consent,

to have the Eklund cranio-caudal view (sub glandular) alongside the conventional views.

Methods: Three cases have been identified where this technique has led to a malignant diagnosis. In all three cases the Eklund view has identified calcifications which were difficult to see on the conventional views.

Results: These cases demonstrate the value of using the Eklund view for screening and symptomatic cases for the initial mammogram and at assessment.

Conclusion: This educational poster shows the importance of this additional view and aims to encourage other breast units to adopt this technique in order to improve the quality of the service offered to the increasing number of women with augmented breasts.

References:

1. Claire Borrelli, Zoe Vegnuti, NHS breast screening programme: Screening women with breast implants. Public Health England, July 2017.

P72 The impact of age on the art of mammography and how to adapt accordingly
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Background: Breast cancer is increasingly a disease of the elderly, with 30% of breast cancer diagnosed over the age of 70. Incidence rates have increased for all age groups with the largest increase in women of screening age. [1] In addition to this, due to increased life expectancy the population aged over 65 now accounts for 18% of the total population. [2] This combined with the Breast Screening Extension means there are more elderly patients having mammography.

Method: A retrospective audit was conducted of the first year of screening extension for our service. The primary aim of this audit was to collect data on patient demographics. Our secondary aim was to describe the technical adaptations developed and utilised by our screening programme to enable adequate imaging in the over 70 population.

Results: Our audit demonstrated the number of patients over 70 attending Breast Screening in our area has increased. 958 patients (3.8%) in 2014/2015 and 1659 patients (7.3%) in 2015/2016; this includes woman

over 75. Showing screening extension has increased by 2.5 times for women aged 70-74, and doubled the total number of women over the age of 70.

Conclusion: Health promotion encourages women over 73 to attend Breast screening. Thus significantly higher numbers of older patients are, and will continue to present technical challenges to a screening programme. Awareness and future planning are essential for imaging in the elderly population. [3] Development of technical adaptations to the art of mammography is key to achieve diagnostic images.

References:

1. Cancer Registrations Statistics, England (2014) Office for National Statistics <http://www.ons.gov.uk/ons/re1/vsobl/cancer-statistics-registrations--england--series-mb1-/index.html>
2. Ageing of the UK population Part of Population Estimates for UK, England and Wales, Scotland and Northern Ireland, (June 2015) Office for National Statistics
3. JMcGhie. J & McClellan. M (1997) Catering for the Needs of an Increasingly Elderly Population in Diagnostic Imaging Radiography 3:209-216

P73 Review of screening cancers which were recalled initially for technically inadequate imaging
Shazia Khan, Sarah Alexander
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Background: It is vital to produce mammographic images of the highest quality in order to maximise the detection of cancer. The transition of screening images to full field digital mammography has been accompanied by an increase locally in proportion of clients recalled for repeat imaging (technical recall (TC)) due to blurring. This initially proved difficult to reduce and a review was undertaken, looking at different stages of the screening process. As part of this, we looked at cases where the client had repeat imaging and then recalled for assessment with a final diagnosis of cancer. In particular, we reviewed the index images and timescales from initial mammogram to assessment clinic.

Results: Over the period 1/11/2014 to 09/11/2017, 3792 patients had repeat imaging. 5 (0.132%) patients were recalled to assessment clinic with a final diagnosis of cancer. In one case, an incidental cancer was detected on ultrasound which was mamographically occult. In

the remaining 4 cases, the mammographic changes were seen in the original views that were taken. The timescale from initial imaging to being seen in the assessment clinic ranged from 29-47 days (ave 39.6 days).

Conclusion: Reading films, which have been deemed technically inadequate, in conjunction with the remaining films, can still demonstrate significant pathology. It is important to highlight that repeating images can also result in lengthening time to diagnosis. Additionally, our findings also demonstrate that in no case did the repeat films reveal significant pathology that wasn't present in the original films.

P75 Prospective audit of the repeat examinations in a breast screening programme

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Background: A high rate of repeat examinations (TR) including technical repeat (TP) and technical recall (TC) was observed in a Breast Screening Programme. The purpose of this audit was to identify the frequency and reasons for those incidences.

Method: In order to understand the reasons, a prospective audit was conducted in the third quarter of 2017 (from July to September) focusing on the following parameters: reason for repeat, laterality, projection, compression force, unit, equipment type, mammographers (radiographers and assistant practitioners) and film readers.

Results: Preliminary analyses identified 397 (2.6%) TR cases out of 14, 814 screenings. Of the total TR, there were 295 cases (74.3%) of TP and 102 cases (25.7%) of TC. 42% (178/424) images were done on static machines whereas 58% (246/424) were performed on mobile units. The main reason given for TP was inadequate position 41.6% (127/305); followed by the image blurring 23.2% (71/305). The majority of TP occurred on the right breast imaging 64% (195/305).

Conclusion: An in-depth, case-by-case analysis is ongoing to ascertain the importance of different variables on the outcome of TR rate. Five units in this programme were located on mobile vans, hence more susceptible to external vibration. This could potentially justify an increased number of blurred images within these particular units. Human factors were also a consideration that requires further rigorous analyses.

P76 Exploring Mammographers' attitudes to audit, service evaluation and research in a U.K. breast screening unit

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Purpose: The Society of Radiographers 1 has set an aim in their 'Research Strategy 2016-2021, that by 2021, all tiers of professional practice including Assistant Practitioners, Practitioners, Advanced Practitioners and Consultant Practitioners should be involved in research activities. With this in mind, departments need to examine whether their workforce will achieve these goals.

This study aims to explore the attitudes of Mammographers' towards conducting research, audit and service evaluation. It is an investigation into current levels of engagement, what motivates practitioners to conduct research activities, and the barriers in place to deter from this. This will evidence and lead to a discussion surrounding these perceived motivations, barriers and limitations and the evidence gathered can be used by the department leads to implement methods to reduce these limitations and facilitate the motivators, potentially enabling a greater contribution of evidence based practice from the unit.

Method: This study is a mixed methods, service evaluation of a U.K. breast screening unit. All staff eligible to conduct mammography within the department were contacted and asked to complete a questionnaire. The questionnaire is to be thematically analysed to generate topics for discussion in subsequent semi-structured interviews with staff within the unit that wish to participate. Both the qualitative and quantitative data collected in the questionnaire is to be analysed and presented in the results as well as the data collected in interviews. This model can be replicated across departments.

Results: (Work in progress –expected April 2018.)

Conclusions: (Work in progress –expected April 2018.)

References:

1. Society and College of Radiographers (2015). Society and College of Radiographers Research Strategy 2016-2021. London: SCoR.

P77 A novel quality control phantom for pressure based mammography paddles

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Purpose: A novel compression paddle which measures applied pressure (kPa) rather than compression force (N) has recently been made available. Previous work has shown that the paddle has no impact on the equipment performance on a GE Senographe Essential Full Field Digital Mammography system.

Although the paddle has a phantom supplied, this is flexible and only one size/thickness per paddle and therefore would not allow appropriate assessment of the consistency and accuracy of applied pressure over time and between machines. Therefore, an inexpensive and novel phantom was developed to ensure the consistency of applied pressure.

Methods: The issue with standard Perspex[KS1] phantoms is the paddle needs to be in electrical contact with the image receptor (IR). The developed phantom allowed conductive connection between the paddle and the IR by using adhesive copper strips. The top layer had the entire surface covered, to allow area detection, the additional layers had copper in the same corner, wrapping from top to bottom.

The following phantoms were tested, 3 repeated measures of force and thickness were recorded for each displayed light level on the paddle.

Conclusion: A novel, inexpensive, phantom has been developed that can measure applied pressure consistency with new pressure based paddles over time. Remedial and suspension levels need to be established, and the method applied across other machines and manufacturers. The greatest variation was found with the thinnest and thickest phantoms; however these do not represent real breast tissue thicknesses so would not be applicable in clinical practice.

P78 Impact of cardiac devices on radiation dose and image quality

Monica Stanway, Amanda Maclaren, Jackie Francis, Karen Litton

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Purpose: An audit was undertaken to explore the effect that cardiac devices had on image quality and radiation dose as care needs to be taken when imaging patients with these devices. [1]

Method: We reviewed mammograms from 38 women with cardiac devices. Compression, breast thickness and dose were compared between sides. The images were also reviewed subjectively. Three patients were excluded. (2 mastectomy, 1 male)

Results: We assumed the null hypotheses that there should be no difference between the device side and contralateral side in terms of dose, compression or breast thickness. We used the paired t-test to analyse the data. The average dose on the device side was higher. (3.83mGy vs 2.93mGy. $p < 0.05$) On the CC view, compression on the device side was lower on both the CC and MLO views, (CC- 69.8N vs. 88.1N. $p < 0.05$, MLO 72.2N vs 101.7N. $p < 0.05$. No difference was found between sides when looking at breast thickness in either view. On subjective review of these mammograms, one would have benefitted from an extra view, six had their image compromised. In five the implant obscured a significant amount of tissue and five images showed a degree of blurring but not enough to repeat the image.

Conclusion: Having a cardiac device reduces the quality and increases the dose of the mammogram on the implant side. In addition the compression on the implant side is lower. Extra views are sometimes needed to include the entire breast.

References:

1. NHSBSP Publication No 63-Third edition October 2017, 10.2.5.1,pg 26

P79 Using dose management data exports to show insights into mammographer practice in the NHSBSP

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The National Institute for Clinical Excellence briefing MIB127 [1] reviewed and described 8 radiation dose management software technologies and summarized 10 studies. None of these studies investigated dose management software for use with mammography data. Following the installation of a dose management

system, an opportunity arose to use data-rich dose management exports to audit dose for a Breast Screening Centre and to show improvement in mammographer performance.

Three mammography units were connected and 59,000 exposures were audited to identify opportunities for improvement. After initial review of the data and agreement of common examination protocol naming system the data quality (percentage of correctly named exposures) increased from 85% to 96%.

The data can be used to show the variations in dose, breast compression or AEC mode use for different mammography rooms or different users etc.

The most interesting aspects of the analysis were concerning the variations in mammographer practice that could be shown using the exported data. Individual mammographers' average compression force ranged from 35N to 64N. Histograms of compression force for each mammographer showed considerable variation in the range and distribution of forces applied. Other researchers have found variations in average compression force in Norway [2] and in the UK [3].

Analysis of the use of AEC mode showed considerable variation in practice between operators even though a standard protocol was implemented.

The presentation will show the results to date in using the dose management system to reduce the variation in operator technique thorough the provision of feedback to operators.

References:

1. National Institute for Health and Care Excellence (NICE), Radiation dose monitoring software for medical imaging with ionising radiation. 2017. Available from <https://www.nice.org.uk/advice/mib127/resources/radiation-dose-monitoring-software-for-medical-imaging-with-ionising-radiation-pdf-2285963340271045> [Accessed Jan 2018]
2. Waade G, Moshina N, Sebuødegård S, Hogg P, Hofvind S. Compression forces used in the Norwegian Breast Cancer Screening Program. *The British Journal of Radiology*. 2017;90(1071):20160770.
3. Mercer C, Hogg P, Szczepura K, Denton E. Practitioner compression force variation in mammography: A 6-year study. *Radiography*. 2013;19(3):200-206.

P80 An audit of partial mammography

Rebecca Bond, Zoe Evans

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Purpose:

- Determine how many partial mammograms are recorded in a six month period in 2015, 2016 and 2017.
- Identify reasons used.
- Determine if we are classing examinations as partial mammograms correctly.
- Review departmental practice and protocols.
- Identify if we are classing pacemakers as a partial mammogram.

Method: Data was taken from NBSS for all examinations recorded as partial mammograms from January 1st – June 30th in 2015, 2016 and 2017. The images for each examination were looked at by two radiographers to see if they agreed with the decision to record as a partial mammogram.

Results: Between January 1st and June 30th 2015, 14,589 women were screened. 76 were recorded as partial mammograms (0.52%). In 2016, 13,487 women were screened, with 76 (0.56%) recorded as partial mammography. In 2017, 12,848 women were screened. 55 women (0.44%) had partial mammography.

Of the 76 partial mammograms in 2015, 91% were correctly recorded. In 2016, 95% were correctly recorded and in 2017, 81% were correctly recorded. Pacemaker/Hickmann Line/Loop recorder and restricted mobility were the top two reasons for recording a partial status.

Conclusions: 0.56% of our total mammograms performed each year are classed as partial mammograms. In cases where it was felt that the examination should not have been classed as a partial; reasons included the demonstration of all tissue in the normal four views or additional views, and pacemaker device present over pectoral muscle.

We are correctly recording pacemakers as partial mammograms, but need to be more uniformed about when to partial these.

P81 Implementation of the Eklund technique into routine clinical practice: an audit

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Purpose/Background/Objectives: In early 2016, Public Health England announced the Eklund technique should be incorporated into the imaging protocol for clients with breast implants attending for breast screening. A departmental audit was carried out to look at the value of the Eklund technique.

Methods: A retrospective review was carried out assessing the time taken to carry out the examination, the diagnostic benefit of the Eklund view, the diagnostic value of the lateral view and the difference in the amount of breast tissue demonstrated between the standard CC and Eklund CC projections.

Results: The audit showed the Eklund technique takes longer than (more than double) a standard appointment slot. Images undertaken using the Eklund technique demonstrated better compression over the anterior aspect of the breast so increasing visualisation of breast tissue structures. The lateral view only provided additional diagnostic information when performed to a high technical standard. The difference in breast tissue demonstrated was widely variable depending upon both the skill of the radiographer and the manoeuvrability of the tissue surrounding the implant.

Conclusions: The audit has identified one key area that requires further evaluation: whether the Eklund view aided the detection of mammographic abnormalities. A repeat audit would be useful to ascertain whether the amount of breast tissue demonstrated on the Eklund views has now increased in accordance with the radiographers' enhanced experience at performing the technique.

Bibliography

Curtis, J & Borrelli C, *Developing a national standard. Imaging & Therapy Practice*, 2013, ISSN: 1360 – 5518 <http://www.sor.org>

Eklund GW, Busby RC, Miller SH and Job JS, *Improved imaging of the augmented breast, American Journal of Roentgenology*, 1988 151:3, 469-473

NHS Breast Screening Programme *Screening women with breast implants (July 2017)*, Public Health England

NHS Cancer Screening Programmes, June 2010 <http://www.cancerscreening.nhs.uk/breastscreen/publications/breast-implants-breast-screening.pdf/>

P82 Ultrasound evaluation of breast microcalcifications: single centre experience

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Background: Mammographic microcalcifications are associated with benign conditions, ductal carcinoma in situ (DCIS) and invasive carcinoma. In our institution, ultrasound is performed on women with microcalcifications > 15mm on mammography and on all women with dense breasts on mammography irrespective of size. The aim of this study is to evaluate the role of ultrasound in the assessment of microcalcifications.

Methods: 120 consecutive women recalled for second stage assessment of screen-detected microcalcifications between 01/11/2016 and 31/01/2017 were identified from clinic. Digital mammography and ultrasound examination findings were recorded from National Breast Screening Service database and histological data was obtained from electronic patient database (Patient Pathway Manager). Breast density, microcalcifications size, ultrasound findings and post-operative histology were documented.

Results: 120 cases identified, 19 excluded for associated mammographic abnormality and 5 for lack of calcification. 96 included. 66/96 (69%) women had heterogeneously dense glandular breast tissue on mammography. The size of microcalcifications ranged from 3mm to 80mm (average 17.5mm).

92/96 women had ultrasound. 4/96 did not have ultrasound according to local protocol. 83/92 (90%) cases were normal. 3/92 (3.3%) showed mass or altered echotexture. 6/92 (6.5%) revealed cysts.

32/96 (33%) malignancies identified, 27/32 (84%) had normal US. 4/32 (12.5%) had a positive correlate. No ultrasound in 1.

5/9 cases with an ultrasound correlate had benign outcome.

Average size of malignant calcification with and without ultrasound correlate was 25mm and 19mm

respectively. 3/4 malignancies seen on ultrasound had invasive disease.

Conclusion: Ultrasound is a valuable adjunct to mammography in the evaluation of microcalcifications.

P83 The impact of simulated double reporting on the detection performance of masses and microcalcifications in FFDM images containing different magnitudes of image blurring

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Purpose: To evaluate the impact of combined observer free-response data on lesion detection performance in blurred full field digital mammography (FFDM) images.

Methods: Free-response data for six observers was combined with a seventh observer to simulate the conditions of double reader image evaluation which is current standard practice in the UK National Health Service Breast Screening Programme. The study contained different magnitudes of simulated motion blur for microcalcifications and masses. In order to combine the free-response data the following rules were used: (i) for lesion localisations the highest rating of the two observers was kept for the combined observer modality, (ii) for non-lesion localisations all unique mark-rating pairs were kept for the analysis. The equally weighted jackknife alternative free-response receiver operating characteristic (wJAFROC) figure of merit (FOM) was used for analysis. Test alpha was set at 0.05 to control the probability of Type I error.

Results: For masses, there was no statistically significant difference between single and combined free-response data ($F(1,6) = 4.04$, $p=0.1001$, -0.031 (-0.070 , 0.008) [treatment difference (95% CI)]. For microcalcifications, there was a statistically significant difference between single and combined free-response data ($F(1,6) = 12.28$, $p=0.0122$, -0.056 (-0.095 , -0.017) [treatment difference (95% CI)].

Conclusion: There was a significant improvement in detection performance when using a combined observer method for the detection of microcalcifications, but not for the detection of masses, in the presence of simulated image blur. Our study suggests double reading could

improve cancer detection performance, particularly when microcalcification is present. Further research is therefore warranted.

P84 Service evaluation of the GE Senographe Pristina™

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Purpose: To evaluate the effectiveness of the GE Senographe Pristina machine within a mammography service.

Method: Following Trust service evaluation approval and University ethics approval, 22 practitioners were evaluated. Two on-line questionnaires distributed at intervals; 0-3months following installation and 6-9months of continued service. Participants were anonymised. Results analysed quantitatively and through thematic analysis.

Results: 86.4% (19/22) of users completed initial evaluation. 77.3% (17/22) completed second evaluation. 84.2% (16/19) of initial users had over 6 years of mammography experience, 5.2% (1/19) 3-6 years and 10.5% (2/19) 1-3 years' experience. All 19 had used manufacturers other than GE machines.

Initial thoughts on the Pristina machine/console were positive (100%) and remained positive (94%) with 1 user at 'neutral' for machine and 'negative' for console.

On initial evaluation 80% (12/15) reported the 'Park' facility would potentially enhance/improve user experience as it could improve posture. Following second valuation 76.5% (13/17) of users had continued positive comments regarding machine ergonomics with no negative comments. 'Easy to reach buttons', 'faster image acquisition' and 'improved image quality' were other positive comments. Two negative design features were commented upon in relation to a light beam shadow artefact and the face shield by one user. On continued evaluation 15/17 (88.2%) rated the Pristina design better overall than the Senographe Essential; 2/17 without the experience to comment upon.

Conclusion: It could be considered that the GE Senographe Pristina has superior qualities in relation to mammographer ergonomic experience and will hope to aid patient positioning which may reduce the burden of technical repeats and recalls into the future.

P85 The impact of simulated motion blur on the physical characteristics of malignant breast masses in full field digital mammography

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Purpose: Assess the impact of simulated motion blur on the physical characteristics of malignant masses in full field digital mammography (FFDM) images.

Methods: Conspicuity measures, including conspicuity index (CI), edge angle (θ), change in grey level (ΔGL), and image noise were calculated for 23 breast masses. Measures of conspicuity explain image blurring behaviour and describe the effect on the physical characteristics of masses. Images with simulated motion, leading to blurring in the magnitude of 0.7 mm and 1.5 mm were compared to images with no blurring.

Results: CI increases as the magnitude of simulated motion blur increases. Statistically significant differences in CI were demonstrated for 0.0–0.7 mm $t(22)=-6.158$ ($p<0.000$); 0.0–1.5 mm $t(22)=-6.273$ ($p<0.000$); and 0.7–1.5 mm ($t(22)=-6.231$ ($p<0.000$)). θ decreases as the magnitude of simulation motion blur increases. Statistically significant differences in θ were demonstrated for 0.0–0.7 mm $t(22)=3.232$ ($p<0.004$); for 0.0–1.5 mm $t(22)=6.592$ ($p<0.000$); and 0.7–1.5mm $t(22)=2.234$ ($p<0.036$). For ΔGL there was no statistically significant difference. For noise there was statistically significant difference 0.0–0.7 mm $t(22)=22.95$ ($p<0.000$), 0.0–1.5mm $t(22)=24.66$ ($p<0.000$), 0.7–1.5 mm $t(22)=18.11$ ($p<0.000$).

Conclusion: Simulated motion blur has a negative impact on edge angle. This means that any changes in the image characteristics of breast masses could negatively affect visual identification. It is reasonable to hypothesize that when the conspicuity of the mass increases it does not necessarily means that the detectability of mass would also increase.

P86 Radio-wave imaging - Frequency response as an aid to lesion characterization. Early concept work

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Aims and Objectives: Electromagnetic wave imaging is a new modality for medical diagnosis applications [1-2]. It works on detecting the contrast in the dielectric properties between different tissue types. Lazenby [3] demonstrated that cancerous lesions have different electromagnetic properties compared to non-cancerous breast tissue due to differences in their water content. The aim of this preliminary evaluation was to show that Multistatic Array processing for Radiowave Image Acquisition (MARIA) (a commercially available radio-wave breast imaging system) could detect these differences and potentially contribute to the diagnostic algorithm to characterize lesions as cancerous or non-cancerous.

Methods: To detect differences, electromagnetic properties of known tissue types were obtained from MARIA system over a range of frequencies (3 to 8 GHz). We then viewed the differences in the frequency response in various tissue types.

Results: Figure 1. shows frequency response for cancerous and non-cancerous lesions obtained from MARIA scans evaluating cases in a symptomatic clinic [4]. These plots demonstrate that biologically distinct lesions show different frequency responses, particularly at high frequencies ($> 5\text{GHz}$). These differences may allow discrimination of different tissue types. For instance, in the examples shown the magnitude for a cancerous case has an average value between 5 and 8 GHz of 0.56, and for a non-cancerous case this value is 0.23.

Conclusion: This initial work on differences in electromagnetic properties of different tissue types is promising that this can potentially contribute to characterization of lesions. Further work will outline analysis of frequency responses on a larger patient cohort.

References:

1. Klemm M, et al. Radar-based breast cancer detection using a hemispherical antenna array—experimental results, IEEE Transactions on Antennas and Propagation, 57(6), 1692–1704 (2009).
2. Preece AW, et al. MARIA M4: clinical evaluation of a prototype ultrawideband radar scanner for

breast cancer detection. Journal of Medical Imaging. 3(3):033502 (2016).

3. Lazebnik M, et al. A large-scale study of the ultrawideband microwave dielectric properties of normal, benign and malignant breast tissues obtained from cancer surgeries, Phys. Med. Biol. 52(20), 6093–6115 (2007).

4. Massey H, et al. Radio-wave detection of breast cancer in the symptomatic clinic- a multi-centre study, International Cambridge conference(2017)

P87 Detection of breast cancer in the symptomatic clinic using radio-wave technology- a multi-centre study

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Aims and Objectives: A commercially-available radio-wave breast imaging system (MARIA®, Micrima Limited, Bristol) has been deployed in multi-site symptomatic clinic. Interim results have been reported previously [1,2,4] including a higher lesion detection sensitivity to cancer in dense tissue [3]. This is the presentation of final statistics from the completed study which uses harmless radio-waves to detect and characterize changes in the dielectric properties in the breast tissue which are associated with the presence of lesions.

Methods: Patients attending symptomatic clinics were identified by clinicians as having a palpable lump. The bilateral reconstructed 3D images were correlated with clinical information and other imaging studies including ultrasound and/ or mammography and, when relevant, core biopsy results to determine sensitivity scores.

Results: From a total of 232 evaluable cases, 90 were confirmed as cancer by means of histology post-image guided biopsy. For these studies, MARIA's overall sensitivity was calculated as 73% in pre-/peri-menopausal women sensitivity was 69% in post-menopausal it was 76% in women with dense breasts (BI-RADS c and d) it was 82 %.in women with very dense breast (BI-RADS d), it was 100% demonstrate that MARIA® can be a great asset for even the most

senior radiologists to conclude a diagnosis. we will include 2 cases to demonstrate that MARIA can be a great asset for even the most senior radiologist to conclude a diagnosis.

Conclusion: Results from the prospective use of MARIA™ on this symptomatic cohort underline its effectiveness in detecting cancers, particularly in the dense breast, with its inherent advantages as a whole-breast, non-ionising modality.

References:

1. M Shere, AW Preece, I Craddock, L Jones, A Valencia. Radar Imaging of Breast Lesions – a clinical evaluation and comparison. Proceedings European Congress on Radiology, 2016, Vienna. European Radiology.

2. M Shere, L Jones, I Lyburn, R Geach, H Massey, L Hobson, S Taylor, P Bannister, N Ridley. Radio-wave radar-based breast imaging system: an initial multi-site clinical evaluation. Proceedings Symposium Mammographicum, 2016. Liverpool. British Journal of Radiology.

3. N Ridley, M Shere, I Lyburn, P Bannister Cancer detection in dense tissue using radiofrequency imaging: a clinical evaluation. Proceedings European Congress on Radiology, 2017, Vienna. European Radiology.

4. AW Preece, I Craddock, M

P88 OPTIMAM Mammography Imaging Database (OMI-DB): fuelling machine learning research Mark Halling-Brown, Mishal Patel, Ken Young Royal Surrey County Hospital

Background: The importance of medical imaging for clinical decision-making has been steadily increasing over recent years, with greater emphasis on the utilization of medical images for preclinical decision making as well as a drive towards quantification of imaging findings by adopting quantitative imaging features. This demand led to the development of a flexible image repository, which retrospectively collects images and data from multiple sites. The OMI-DB1,2 was created to provide a centralized, fully annotated dataset for research.

Methods: OMI-DB contains processed and unprocessed images, associated data, annotations and expert-determined ground-truths. Furthermore, calculated and derived data are obtained from the

images resulting in a huge number of quantitative image features, properties and characteristics that can be useful for classification, CAD and radiomics/radiogenomics applications.

Results: A research dataset of this scale, which includes original normal and subsequent malignant cases along with expert derived ground-truths, clinical annotations and quantitative features, is currently unique. These data provide a powerful resource for future research and has initiated new research projects, amongst which, is the quantification of normal cases by applying a large number of quantitative imaging features, with *a priori* knowledge that eventually these cases develop a malignancy.

Conclusion: The provision of unprocessed images enables a multitude of potential research applications.

The availability of associated data and expertly determined ground truth along with computational image feature extraction can facilitate many data intensive research applications. Such as building predictive models to aid image classification, treatment response assessment as well as to identify prognostic imaging biomarkers.

References:

1. Halling-Brown, M., Looney, P. T., Patel, M., Warren, L., Mackenzie, A., and Young, K. C., Proc. SPIE 9039 Medical Imaging (2014)
2. Patel, M. N., Looney, P. T., Young, K. C., and Halling-Brown, M. D., Proc. SPIE 9039 Medical Imaging (2014)

P89 Ultrasound advancements in cancer screening for the dense breast.

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The poster aims to critically evaluate the advancement of ultrasound technology for the diagnosis of breast cancer in the dense breast and the impact this may have on the patient pathway and the NHS.

Key findings showed that sensitivity values were low for mammography in the dense breast so another modality such as ultrasound could be beneficial for imaging for patients with this type of breast tissue.

The use of Automated Breast Ultrasound (ABUS) and Contrast Enhanced Ultrasound (CEUS) will be

discussed in order to provide a gold-standard quality of imaging for patients with a heterogeneously dense breast.

The key implications of introducing more ultrasound services for diagnosis could be at the detriment to current screening programs as mammographers and sonographers will have to partake in more training and there would need to be a change of current legislation and protocols. Although, in the long term, these changes could be of benefit to the patient as these technologies have higher sensitivities and specificities.

References:

1. Duffy SW, Tabar L, Olsen AH, Vitak B, Allgood PC, Chen THH, Yen AMF, Smith RA. Absolute Numbers of Lives Saved and Overdiagnosis in Breast Cancer Screening, from a Randomized Trial and from the Breast Screening Programme in England. Online at: <http://journals.sagepub.com/doi/10.1258/jms.2009.009094> [Accessed 25th May 2018]
2. Freer PE. Mammographic Breast Density: Impact on Breast Cancer Risk and Implications for Screening. Online. Available at: <https://pubs.rsna.org/doi/full/10.1148/rq.352140106> [Accessed 25th May 2018]
3. Berg WA. Current Status of Supplemental Screening in Dense Breasts. Online. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5474360/> [Accessed 25th May 2018]
4. GE Healthcare. Automated Breast Ultrasound Clarifies Diagnosis of Subareolar Mass in Dense Breast. Available at: http://www3.gehealthcare.com/~media/downloads/us/product/product-categories/ultrasound/invenia%20abus/global%20dr%20souders%20abus%20case%20study_final%202017.pdf [Accessed 25th May 2018]
5. Shin HJ, Kim HH, Cha JH. Current status of automated breast ultrasonography. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4484287/> [Accessed 25th May 2018]
6. Yuan Z, Quan J, Yunxiao Z, Jian C, Zhu H, Liping G. Diagnostic Value of Contrast-Enhanced Ultrasound Parametric Imaging in Breast Tumors. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3706868/> [Accessed 25th May 2018]
7. Marshall G, Sykes A, Berry J, Jonker L. The “humble” bubble: Contrast-enhanced ultrasound.

Available at: [www.radiographyonline.com/article/S1078-8174\(11\)00053-8/fulltext](http://www.radiographyonline.com/article/S1078-8174(11)00053-8/fulltext) [Accessed 25th May 2018]

8. Xiao X, Ou B, Yang H, Wu H, Luo B. Breast Contrast-Enhanced Ultrasound: Is a Scoring System Feasible? ---A Preliminary Study in China. Available at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0105517> [Accessed 25th May 2018]

9. Hellgren R, Dickman P, Leifland K, Saracco A, Hall P, Celebioglu F. Comparison of handheld ultrasound and automated breast ultrasound in women recalled after mammography screening. Available at: <http://journals.sagepub.com/doi/abs/10.1177/0284185116665421?journalCode=acrc> [Accessed 25th May 2018]

10. Drukteinis JS, Mooney BP, Flowers CI, Gatenby RA. Beyond Mammography: New Frontiers in Breast Cancer Screening. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4010151/> [Accessed 25th May 2018]

11. Pan HB. The Role of Breast Ultrasound in Early Cancer Detection. Available at: <https://www.sciencedirect.com/science/article/pii/S0929644116300686> [Accessed 29th May 2018]

P90 Evaluating current and advancing techniques, technology and pharmaceuticals in ultrasound for breast cancer

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Advances in techniques, technology and pharmaceuticals in breast ultrasound all play important roles in improving the patient pathway for breast cancer both today and in the future.

Colour doppler and shear-wave elastography are both current ultrasound technologies used in breast ultrasound. Colour doppler assesses the vascularity of breast lesions allowing for improved characterisation through assessing the vascularity pattern. Shear-wave elastography assesses the elasticity of a lesion, measuring the velocity that shear waves travel through the lesion. The results are demonstrated on a colour map with bright areas indicating a stiff lesion which is indicative of a malignant breast lesion.

Multimodal ultrasound tomography is a technology currently in research stage, being developed as a possible future screening tool with promising results.

The 3D coronal slices analyse the micromechanical properties of the breast tissue differentiating benign from malignant lesions.

Contrast enhanced ultrasound allows real time assessment of the perfusion of breast lesions and differential diagnosis between malignant and benign lesions with the potential for decreased biopsies in the future.

Intraoperative ultrasound-guided breast cancer surgery for early-stage invasive breast cancer has been shown to be superior to the standard palpation-guided surgery as it allows for localisation and continuous visualisation of the lesion through surgery.

Breast ultrasound is a first line test for under-40 year olds and a complementary tool to mammographic findings. Technological developments are leading to increased specificity for characterisation of lesions and breast ultrasound is now an important modality in screening, diagnosis, planning and treatment of breast lesions.

References:

1. Choi, J., Han, B., Ko, E.Y., Ko, E.S., Shin, J. and Kim, G. Additional diagnostic value of shear-wave elastography and color Doppler US for evaluation of breast non-mass lesions detected at B-mode US. *European Radiology*. 2016; 26(10), pp. 3542-3549.
2. Dahiya, N. and Dogra, V. *Ultrasound Clinics: Small Parts and Superficial Structures*. London: Elsevier Health Sciences; 2014.
3. Zografos, G., Liakou, P., Koulocheri, D., Liovarou, I., Sofras, M., Hadjiagapis, S., Orme, M. and Marmarelis, V. Differentiation of BIRADS-4 small breast lesions via Multimodal Ultrasound Tomography. *European Radiology*. 2015; 25(2), pp. 410-418.

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