Breast Cancer Research 2017, **19**(Suppl 1):116
DOI 10.1186/s13058-017-0903-9

Breast Cancer Research

MEETING ABSTRACTS Open Access

British Society of Breast Radiology Annual Scientific Meeting 2017

Dublin, Ireland. 5-7 November 2017

Published: 1 November 2017

Presentation Type: Oral

O.1

Contrast enhanced spectral mammography (CESM) and breast MRI- different techniques used to monitor response to neoadjuvant chemotherapy in patients with breast cancer

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Breast Cancer Research 2017, **19(Suppl 1):**O.1

Introduction
Comparison of contrast enhanced spectral mammography (CESM) and breast MRI in monitoring response to neoadjuvant chemotherapy in patients with breast cancer according to different patterns of enhancement and histological type of cancer.
Method
29 women diagnosed with breast cancer at Guy's Hospital between October 2015 and May 2016 receiving neoadjuvant chemotherapy were consented to the study. Patients have been offered both CESM and breast MRI before, during and at the end of their treatment. Quantification of the response was done using RECIST criteria. Patterns of enhancement, histological tumour type and final pathological response to treatment were assessed.
Results
26 patients were considered to have a response to treatment on both CESM and MRI compared to 23 cases on final pathology specimen. Negative predictive value (NPV) was much higher on breast MRI (98%) compared to CESM (46%) while positive predictive value (PPV) was higher on CESM (70%) compared to MRI (37 %) Enhancement pattern was clumped or mass like in 19, diffuse or punctate in 7. Patients with higher DCIS component were likely to have some residual enhancement which has been underestimated on CESM and slightly overestimated on MRI, especially when compared to those cases with low and intermediate grade DCIS.
Conclusion
CESM has the potential of monitoring response to neoadjuvant chemotherapy especially in patients with pure invasive breast cancers, however in lesions with associated DCIS component CESM tends to underestimate disease the extent of the disease.

O.2

Utility of using mammographic density and clinical risk factors to identify higher risk women in an average-risk screening cohort. What is necessary? What is sufficient?

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Breast Cancer Research 2017, **19(Suppl 1):**O.2

Introduction
In the average risk population, mammographic density better predicts breast cancer than risk models using clinical risk factors. This study evaluated the consistency of several risk models to identify patients at higher risk within this population.
Methods
This 2:1 age- and screen-matched case control study sampled all unilateral screen-detected breast cancer cases from a Canadian breast screening program, diagnosed among digitally screened women aged 40-75 (2009-2013). Clinical risk factor data and fully-automated area-based mammographic density assessments were obtained for 392 cases and 817 controls, and used to derive patient-specific risk estimates from models that included density and clinical risk factors alone and in combination. Agreement was assessed using Intraclass Correlation Coefficient (ICC) and Kappa.
Results
Agreement between model risk estimates was highly variable (ICC=0-0.98, Kappa=0-0.88) and was very poor between models including density alone and models with combinations of clinical risk factors (ICC=0.039, Kappa=0.043). Agreement was almost perfect between a model including density, family history and age and a model including density and all clinical risk factors (ICC=0.98, Kappa=0.88).
Conclusion
Risk models with varying sets of predictors generate different risk estimates for the same woman and could significantly alter follow-up recommendations, especially for higher risk women. A risk model that includes mammographic density, family history and age provides a practicable and pragmatic solution for identifying higher risk women in the population-based average risk screening setting.

O.3

The impact of weight change from age 20 to age at breast screening on mammographic density

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Breast Cancer Research 2017, **19(Suppl 1):**O.3

Introduction
Higher weight and higher percentage breast density are both associated with an increased risk of breast cancer in postmenopausal women, but are negatively correlated. Weight gained since age 20 is also associated with increased risk. This study investigates the relationship between weight change since age 20 and mammographic density at screening.

Methods
Participants were 14924 postmenopausal women attending routine breast screening who consented to take part in the Predicting Risk Of Cancer At Screening (PROCAS) study. Current weight, weight aged 20 and other classical breast cancer risk factors were collected via self-reported questionnaires. Mammographic density was assessed from digital mammograms using Volpara™ and Densitas™. The relationship between change in weight and breast density was examined using multiple linear regression adjusting for age, number of children and HRT use.
Results
Mean age of participants was 61.3 years. The correlation between weight at age 20 and current weight was 0.509 ($p<0.001$) and median weight change was +11.8kg (IQR 6.4-19.5kg). For each 1% increase in weight from age 20 there was a statistically significant 0.4% increase in both Densitas™ dense area and Volpara™ dense volume, but there was a statistically significant 0.9% and 0.13% decrease in percentage density for Volpara™ and Densitas™ respectively.
Conclusions
This study provides evidence that weight gain is associated with higher absolute breast density in postmenopausal women, which may confer a higher breast cancer risk. Strategies to reduce weight gain should be considered.

O.4

Preoperative assessment of breast cancer by core grade, tumour diameter, stromal stiffness, presentation and pre-operative nodal status and breast cancer specific survival

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Breast Cancer Research 2017, **19(Suppl 1):**O.4

Introduction
The increased use of neoadjuvant therapy means there is a need for pre-operative prediction of prognosis. We aimed to assess the prognostic value of pre-operative factors and combine them to form a predictive model.
Methods
Consecutive patients with invasive breast cancer undergoing breast ultrasound (US) had the lesion diameter, mean stiffness (kPa) at shearwave elastography (SWE), presentation (screening or symptomatic) core grade and pre-operative nodal status recorded prospectively. Subsequent breast cancer specific survival (BCSS) was ascertained for 3 equal sized groups based on US size and stiffness using Kaplan-Meier survival curves. BCSS according to core grade, presentation and pre-operative nodal status were also produced. Multivariate analysis used cox proportional hazards and a prognostic model was assessed using ROC curves.
Results
Among 520 patients, 40 breast cancer deaths were recorded at mean follow-up of 5.0 years. BCSS for three equal groups based on SWE were 98%, 92% and 86% ($p=0.0001$) and on US size 99%, 96% and 82% ($p<0.0001$). At multivariate analysis all factors except pre-operative nodal status retained significance. A model based on these 4 factors gave BCSS for three equal sized groups of 100%, 95% and 82% ($p<0.0001$). The model gave identical prognostic information to the Nottingham Prognostic Index (NPI) (AUC 0.86 for both).
Conclusion
We propose a pre-operative model based on US size, stiffness, core grade and presentation. If validated the model could be used to assess the appropriateness of neoadjuvant therapy.

O.5

A fresh look at CT staging in breast cancer: can we do better?

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Breast Cancer Research 2017, **19(Suppl 1):**O.5

Introduction
National consensus is lacking and variable practice persists with regard to staging of breast cancer patients. Referrals for pre-treatment staging CT (on the basis of sonographic and cytological/histological involvement of axillary nodes or before neo-adjuvant chemotherapy) have increased at our institution. This study assesses the benefit of our current staging practice.
Methods
Retrospective data were collected for all patients diagnosed with breast cancer over 2 years at our institution. Those with ipsilateral recurrence or symptoms of metastases were later excluded. Data were analysed using Excel/SPSS.
Results
671 patients were identified (273 screening, 388 symptomatic, 10 incidental on CT). 160 pre-operative staging CTs were performed for: recurrence/symptoms (n=45), T4 disease (n=35) and lower imaging T stages (n=80), with metastases found in 15% (n=24). Metastatic disease was found in lower T stages in association with an axillary nodal mass (20%), tumour size ≥3cm with evidence of nodal involvement (7.7%) and in patients with sonographically normal axillary nodes referred for neo-adjuvant chemotherapy (16.7%). Inclusion of these patients resulted in the detection of 4 additional metastatic cases (4/24,16.6%). Post-operative staging CTs performed for pN2+ disease yielded a positivity rate of only 5.4% (2/37).
Conclusion
The results suggest that pre-operative staging should be considered for patients with sonographic evidence of an axillary nodal mass, tumour size ≥3cm with nodal involvement, and prior to neo-adjuvant chemotherapy, in addition to the established recommendations (T4, recurrence or symptoms of metastases). Adoption of these criteria may necessitate review of the current guidance advocating post-operative staging for pN2+ disease.

O.6

The effect of radiographic parameters on measurement of change in breast density

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Breast Cancer Research 2017, **19(Suppl 1):**O.6

Introduction
During mammography, the breast is compressed to optimise imaging quality whilst reducing radiation exposure; however imaging parameters, particularly applied compression force and compressed breast thickness, vary between radiographers and by the breast being imaged. This study investigates the effect of these parameters on measurement of breast density change between screens.
Methods
Participants were 4339 postmenopausal women who attended two consecutive routine mammographic screens and consented to take part in the Predicting Risk Of Cancer At Screening (PROCAS) study.

Percent mammographic density was assessed from digital mammograms using Volpara™ and compression force and compressed breast thickness obtained from the DICOM headers. The relationship between radiographic parameters and breast density was assessed using t-tests and multiple linear regression.

Results

Mean age of participants was 60.4 years at first screen, with an average 2 years and 9 months between mammograms. Breast density decreased significantly from first to second screen ($p<0.001$), whilst compression force and breast thickness increased significantly ($p<0.001$). There was a statistically significant reduction in breast density between screens of 0.002% per 1N increase between screens, in compression force ($p=0.007$). There was also a statistically significant reduction between screens of 0.1% per 1mm increase between screens, in breast thickness ($p<0.001$). There was no significant difference in change in breast density between mammograms performed by the same or different radiographers.

Conclusion

Breast density reduced between screens, however some of this reduction may be explained by variations in radiographic technique. Additional guidance on these parameters may help provide more stable estimates over time.

Presentation Type: Poster

PA.1

Homemade ultrasound phantom for core biopsy practice in breast radiology

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Breast Cancer Research 2017, **19(Suppl 1):**PA.1

The use of ultrasound biopsy phantoms forms an essential part of training, helping trainees to gain familiarity and confidence with ultrasound-guided biopsy procedures. Traditionally, commercially available phantoms or raw meat have been used for training purposes. However, cost and degradation with repeated use limits the use of commercially available phantoms and infection control concerns prevents the use of raw meat. A cheap, safely disposable, compact and easily stored ultrasound phantom which mimics the sonographic appearances of tissue and conceals target lesions can form an invaluable tool for ultrasound biopsy practice. We describe the preparation of an easily made, low cost ultrasound phantom which mimics tissue/target lesions and can be easily transported/stored. The phantom is of suitable density mimicking human tissue allowing repeated practice.

PA.2

Hide and seek in augmented breasts

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Breast Cancer Research 2017, **19(Suppl 1):**PA.2

Background

Cosmetic breast implants are becoming increasingly frequent. Women undergo breast augmentation for a variety of reasons ranging from purely aesthetic choice to reconstructive surgery post-mastectomy.

Although breast implants are not necessarily associated with an increased cancer incidence it is widely known that breast implants may cause a delay in diagnosing breast cancer in women (26% risk of later stage diagnosis), therefore increasing their risk of dying from the condition (38% greater when compared to women without implants).

Mammography remains the gold standard for imaging augmented breast, although its sensitivity may be reduced by the physical presence of the implant.

Objectives and Methods

We are presenting 10 representative cases from our practice in which women had both subpectoral and subglandular breast implants, respectively. The presentation was both in screening and symptomatic clinic setting.

This pictorial review will help the reader understand the challenges posed by imaging augmented breasts and will demonstrated how subtle and more advanced malignant disease is picked up on the additional mammographic views recognizing the need and importance of these images in order to be able to visualise as much breast tissue as possible.

All patients who underwent augmentation mammoplasty should be offered mammography. Sonography may be helpful in evaluating palpable masses even when mammography is normal.

PA.3

Breast cancer recurrence in autologous DIEP flap reconstruction – a case review

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Breast Cancer Research 2017, **19(Suppl 1):**PA.3

Breast reconstruction is increasingly common in the management of breast cancer, with gradually more patients choosing breast reconstruction following mastectomy. Deep Inferior Epigastric Perforators (DIEP) reconstruction preserves the rectus muscle and rectus sheath. It is associated with reduced postoperative pain, improved residual abdominal wall strength and a decreased chance of abdominal wall hernia, compared to TRAM flap reconstruction.

Breast cancer recurrence in the ipsilateral breast has been reported at 5.7% for DIEP reconstruction (including patient with immediate and delayed reconstruction). Recurrence in itself is a poor prognostic factor, early detection and management can improve morbidity and mortality.

This poster will display cases of local breast cancer recurrence in patients who have undergone DIEP reconstruction, with varying recurrence location and imaging appearances. The cases all concern patients who underwent DIEP flap reconstruction. Case 1 demonstrates a recurrence beneath the medial scar. Case 2 involves a patient with delayed DIEP and implants, found to have a right infraclavicular mass. Case 3 shows recurrence in the flap superiorly. The fourth case was a DIEP and expander implant reconstruction, which found recurrence at the implant port site.

The anatomy of DIEP flap reconstruction will be outlined, and case recurrence sites will be mapped alongside the flap anatomy. The poster also proposes that an understanding of the flap anatomy is an important consideration in the imaging surveillance of the reconstructed breast.

This poster is aimed at all healthcare professionals who perform and report breast imaging, with a particular focus on ultrasound.

PA.4

Paediatric Breast Lesions - what am I looking at?

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Breast Cancer Research 2017, **19(Suppl 1):**PA.4

Breast masses are rare in the paediatric and adolescent population. Most cases are benign, and a diagnosis is made following a single ultrasound. However, patients and their families are often anxious and occasionally a mass can generate further investigations for

definitive diagnosis (eg. MRI or tissue sampling). We present an educational pictorial review of paediatric breast lesions that have been referred to our Radiology Department in the recent past. All cases are from symptomatic patients under 18 years old imaged at our teaching hospital, both in the Paediatric Radiology Department and in the Breast Imaging Unit. Our imaging series features the normal breast bud in different stages of development both pre and post puberty as well as a range of pathologies. We describe and illustrate breast masses due to common pathologies – such as simple gynaecomastia, haemangioma and benign neoplasms such as a fibroadenoma – to rarer malignant masses. For example, we discuss an interesting case of a benign retro-areolar lymphatic malformation in a child and the imaging of a breast rhabdomyosarcoma in a prepubertal patient. Our aim is to educate and increase the confidence of Radiologists with a breast or paediatric subspecialty interest in establishing the diagnosis of a breast mass in the young patient with minimal intervention. Learning objectives: · To learn the sonographic appearances of the normal stages of breast bud development, from infancy to post-puberty · To recognize the imaging characteristics of common and less common breast masses seen in the paediatric population, benign and malignant · To understand the rationale for additional diagnostic investigations in establishing a definitive diagnosis.

PA.5

A pictorial review: guidewire bracketing – which radial margin is most relevant for which surgical procedure?

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Breast Cancer Research 2017, **19(Suppl 1):**PA.5

Increasingly patients are offered breast conserving surgery where possible, with oncoplastic procedures favoured over mastectomy. One of the roles of the breast radiologist is to help the surgeon define the margin at the time of surgery. We reviewed cases of bracketing guidewires in a 600+ cancer per annum breast unit and present this pictorial review of educational cases to demonstrate guidewire use and the value of understanding the oncoplastic surgical techniques when planning the wire placement.

The majority of cases of bracketing guidewires in our institution are placed to define a region of microcalcification in either mediolateral or superoinferior extent. However, occasionally the surgeon requires localisation of anteroposterior trajectory. Many guidewires are placed with ultrasound guidance to localise one or more post-biopsy clips however occasionally prone table stereotactic insertion is required, especially when microcalcification is present.

We present a variety of cases which have been bracketed in slightly different ways with the aim of providing the best surgical outcome. Three to four case reviews with brief case summaries and relevant images demonstrate bracketing of superoinferior, mediolateral and anteroposterior extent of breast abnormalities with post-operative histological data regarding margin clearance. Surgical diagrams for each case highlight where the bracketing was most useful and demonstrate how in oncoplastic procedures bracketing guidewires can provide intraoperative benefit to the surgeon.

PA.6

Contrast Enhanced Spectral Mammography- understanding the pitfalls of this new technique

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Breast Cancer Research 2017, **19(Suppl 1):**PA.6

Introduction/ Purpose

Contrast Enhanced Spectral Mammography (CESM) is an emerging technique that combines the efficiency and low cost of conventional full field digital mammography (FFDM) with high sensitivity comparable to breast MRI. CESM has increased diagnostic accuracy in symptomatic and screening patients compared to FFDM alone or in combination with ultrasound and has a valuable role in breast cancer detection in patients with dense breasts and multi centric disease. However it is important to understand the limitations of this technique and the most common diagnostic interpretation errors are discussed in this presentation highlighting the pitfalls and artefacts of this technique.

Materials and methods

Review of over 50 cases undertaken in the symptomatic and screening assessment clinics revealed a variety of interpretation challenges. Cases were reviewed in consensus with full knowledge of all other imaging modalities, the final histology or follow up.

Results

Experience-based examples of cases include: interpretation difficulties due to background enhancement, artefacts including rim and ripple artefact, axillary and skin-line enhancement, non-mass enhancement, non-enhancing malignant calcification and benign enhancing lesions.

Conclusion

Many centres are now introducing CESM as a diagnostic adjunct and understanding the artefacts and pitfalls of this technique is important for the radiologist. An appreciation of the diagnostic limitations and when to search for the additional lesion or proceed to further imaging is essential for the breast cancer diagnostic pathway. Our aim is to produce a check list to improve diagnostic accuracy.

PA.7

Pictorial review of primary breast lymphoma

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Breast Cancer Research 2017, **19(Suppl 1):**PA.7

Primary breast lymphoma (PBL) is a rare disease accounting for 0.4-0.5% of all breast malignancies. It refers to malignant lymphoma within the breast in the absence of extra mammary lymphoma.

We present four cases of PBL at our institution who presented over a two year period (2015-2017) with a painless mass in different quadrants of the breast. Mammographic appearances were variable and included solitary mass, asymmetry and trabecular thickening. The lesions did not have spiculated margins or calcifications, typical of primary breast cancer. Ultrasound findings varied from hypoechoic circumscribed mass to mixed echogenicity plaque. All demonstrated internal vascularity.

Core biopsy confirmed the diagnosis in all cases. They were subsequently referred to hematology multidisciplinary meeting for treatment with chemo-radiation.

These cases highlight the non-specific nature of radiological appearances of PBL. Histology remains crucial for correct diagnosis given the different management pathways.

References

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PA.8

A pictorial review of unusual presentations of DCIS on mammography and ultrasound

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Breast Cancer Research 2017, **19(Suppl 1):**PA.8

Typical features of Ductal carcinoma in situ (DCIS) are well described in the literature, particularly mammographic and sonographic appearances. However, occult and equivocal findings are common,

particularly in the absence of the classic findings of microcalcifications. This pictorial review focuses on the role of mammography and ultrasound in the evaluation of DCIS.
We present the imaging features of a series of patients at our institution with histologically proven DCIS, who either presented as a mass or asymmetry on screening mammograms or referred to the breast clinic for a palpable lump in the breast. Ultrasound findings proved to be variable from an ill-defined hypoechoic mass to intracystic solid lesions, which can be features of invasive disease. These lesions were particularly difficult to characterise in dense breasts. Histopathology results showed these lesions were non-high grade DCIS.
Mammography and ultrasound is the mainstay of lesion identification, with MRI reserved for indeterminate cases. With the increased implementation of ultrasound for targeted biopsies, familiarity with the varying features of non-calcified DCIS is essential for achieving diagnosis and guiding further management.

PA.9

Ophthalmic manifestations of breast cancer: a pictorial review

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Background
Breast cancer is the most prevalent female malignancy, with one in every nine Irish women being diagnosed in her lifetime. Although rare, it is important to be aware that breast cancer can present with ophthalmic signs and symptoms, and to be familiar with the spectrum of findings on imaging. By correctly identifying the imaging features, the radiologist may be the first to suggest the diagnosis and can appropriately direct further investigation.
Learning objectives
1. To acknowledge that breast cancer may rarely underlie ophthalmic presentations.
2. To recognize the salient imaging features in such cases.
Methods
We describe three cases of breast cancer who presented with ophthalmic symptoms and signs; the first presented with an upper eyelid mass lesion, the second with unilateral retro-orbital headache, periorbital swelling and restricted eye movement, and the third with generalized headache and oculomotor nerve palsy. We also review the literature on ophthalmic manifestations of breast cancer and the role of imaging in its diagnosis.
Results
CT and MRI of the orbits and brain identified the lesions responsible for these presentations and helped guide clinical, radiological and pathological investigations towards the underlying diagnosis of primary breast cancer in each case.
Conclusion
Breast cancer is a rare but potentially important cause of ophthalmic complaints. This poster emphasizes how recognition of the imaging features can prompt the diagnosis, direct the diagnostic workup and expedite the underlying diagnosis in such cases.

PA.10

The augmented and reconstructed breast on cross sectional imaging: what EVERY radiologist needs to know

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Advances in frequently performed Breast Augmentation/Reconstructive techniques, coupled with increased cross sectional imaging requires that all radiologists, both breast and non-breast specialists need to be adept at identifying the normal, variant and pathological appearances of augmented/reconstructed breast. Literature reviewing appearances of the augmented/reconstructed breast included on Computerised Tomography (CT) and Magnetic Resonance Imaging (MRI) is limited.
The aim of this pictorial review is to familiarise radiologists with typical appearances, variations and incidental findings specific to the augmented/reconstructed breast, focusing on cross sectional techniques.
Learning objectives

1. To understand normal CT and MRI appearances of common implants and injectables, including silicone and macrolaine.
2. To identify CT and MRI appearances of common reconstructions, including traditional latissimus dorsi, TRAM (transverse rectus abdominis myocutaneous) and DIEP (deep inferior epigastric perforators) flaps, plus newer Biologic grafts.
3. To recognise significant complications in the augmented/reconstructed breast.
4. To recognise breast disease unrelated to the implant/reconstruction, i.e. recurrent breast cancer.

PA.11

Radiologic and pathologic features of breast fibromatosis. Pictorial review and clinical update for a challenging clinical entity

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Breast Cancer Research 2017, **19(Suppl 1):**PA.11

Background
Breast fibromatosis is a rare disease characterised by monoclonal fibroblast proliferation. While it has no ability to metastasize, it can be locally recurrent and destructive, with significant aesthetic implications. A recent prospective study published in the European Journal of Cancer highlighted the importance of individualised management of fibromatosis, taking particular note of location of the original lesion. Surgical treatment was previously been the standard for breast fibromatosis, however new targeted medical therapies have emerged, making the correct distinction of fibromatosis from breast malignancy of paramount importance.
Learning Objectives
In order to improve diagnosis of this rare condition and to guide appropriate treatment, we present a series of images from our institution illustrating the characteristic imaging features on ultrasound, mammogram and magnetic resonance imaging. The features that overlap and allow distinction from common breast carcinomas on imaging are highlighted. The challenges with diagnosis are discussed including the need for MR guided and vacuum biopsy. Follow-up regimens are suggested given the high incidence of recurrence and the current trend towards medical rather than surgical management. The histopathological findings are also presented including the features that differentiate fibromatosis from other benign sclerotic breast conditions, in particular cytokeratin and β-catenin staining.
Conclusion
Breast Fibromatosis is a rare condition that represents a significant diagnostic challenge. In order to guide treatment in the context of evolving best practice, these images illustrate the characteristic features of this disease, and highlight potential pitfalls in diagnosis and follow up.

PA.12

A retrospective pictorial review of ultrasound imaging features of UK-RCR breast imaging score 3 lesions, which subsequently displayed malignant histology. Which characteristics in retrospect should have raised suspicion for a cancer?

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Breast Cancer Research 2017, **19(Suppl 1):**PA.12

The purpose of this exhibit is to
1. Outline the sonographic features of breast lesion benignity and malignancy.
2. To review the ultrasound imaging features of UK-RCR 3 lesions, thought probably benign, that were subsequently found to demonstrate malignant histology.
3. To discuss whether suspicious ultrasound characteristics were present in retrospect which should have raised suspicion for a cancer
4. To reinforce the importance of proceeding to biopsy for all lesions with benign characteristics in the presence of even a single suspicious characteristic.

Background context
In our institution, there have been 24 breast lesions between 2014-2016, which were classified as U3, which were subsequently found to demonstrate malignant histology. These 24 cases reinforce the importance of proceeding to biopsy for all indeterminate lesions, even if the suspicion for malignancy is low.

Pictorial review
We review the imaging features of the U3 lesions in our institution, which underwent biopsy, and subsequently demonstrated malignant histology. Representative cases include lesions such as presumed fibroadenoma, presumed fat necrosis and haematoma, presumed cyst containing viscous fluid and presumed ridge of glandular tissue. We review the sonographic images of these lesions and the subtle characteristics which should have raised suspicion for malignancy and should possibly upgrade classification to U4 or higher.

Conclusion
It is important to proceed to biopsy for all indeterminate lesions, even if the suspicion for malignancy is low.

PA.13

Imaging in breast augmentation using injectable materials: a pictorial review

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Breast Cancer Research 2017, **19(Suppl 1):**PA.13

Breast augmentation is performed for cosmetic purpose as well as an oncoplastic procedure. Whilst breast augmentation by implant prosthesis is commonest, in UK, we sometimes come across some odd cases when this is done by various injectable materials. We present a pictorial review of Imaging in breast augmentation following injectable materials such as soya oil injections, collagen injections, silicone injections or lipofilling. The appearances on various imaging modalities are varied and sometimes shocking.
We present a pictorial review of imaging of cases from our trust who presented in a symptomatic clinic and who had breast augmentation with injectable materials for cosmetic purpose. The breast augmentation following oncological treatment was mostly with lipofilling.
These cases are always challenging for radiologists and breast surgeons as it is difficult to completely exclude a malignancy.

Conclusion
Breast augmentation following injectable materials are banned in UK. However in other parts of world it is still carried out and these can present as a challenge to radiologists and surgeons when some patients present in a symptomatic clinic with a lump. We present a pictorial review of imaging and associated challenges in various cases of breast augmentation with injectable materials.

PA.14

Do pathologists have X-ray vision?

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Breast Cancer Research 2017, **19(Suppl 1):**PA.14

Breast biopsy specimens containing marker clips are routine in a breast unit. Our unit uses two types of clips, the Hydromark clip for ultrasound and Senomark ultra clip for stereo cases. The clip often results in cellular changes which is unique to the type of clip. This allows the pathologist to identify the type of clip we used based on the microscopic appearance in the tissue. This also allows the pathologist to comment on how close a clip may be to a surgical margin, if the clip is not retrieved in the surgical specimen.
In our unit, we also performed radio-iodine seed in localisation of breast tumour 7-14 days prior to surgery. The breast tissue specimen in these cases shows no microscopic changes surrounding the seed.
We will present a pictorial review of classical histological appearances for the two standard image guided clips used in our unit and the radioactive iodine seed.

Conclusion
In conclusion, this pathological response of clips could be relevant in cases where clips were not retrieved surgically or following a radiological biopsy. The histological appearance could help us identify the site of previous biopsy. This may allow in certain cases the pathologist to guide the surgeons to the site of the clip, if further surgery is required due to positive margins.

PA.15

Unusual cases of breast metaplastic carcinoma with chondroid differentiation

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Breast Cancer Research 2017, **19(Suppl 1):**PA.15

Metaplastic carcinoma is a rare cancer with mixed epithelial and sarcomatoid elements, representing 0.25-1% of all breast cancers.
Metaplastic tumours with chondroid differentiation (MCCD) are a variant within this group, showing transition from overt carcinoma to a lesion with matrix producing chondral or osseous or mixed cartilaginous/osseous matrix. MCCDs have a more favourable 5-year survival than other metaplastic carcinomas (which tend to be more aggressive). It is therefore important to recognise or consider this rare tumour when imaging a patient at presentation.
This pictorial case presentation illustrates the radiological features of two cases of metaplastic carcinoma with chondroid differentiation presenting at our institution. For both cases the imaging features and differential diagnosis are critically appraised. We describe the amorphous or coarse calcifications associated with MCCDs on mammography, which should not be dismissed as part of a benign process. The ultrasound images reveal the complex appearances of these lesions sonographically, which could produce a wide differential. With the cases presented we aim to improve awareness and imaging identification of this rare and interesting lesion.

PB.1

Preoperative axillary assessment: comparison of 2006-09 with 2015 data in Cardiff and Vale UHB

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Breast Cancer Research 2017, **19(Suppl 1):**PB.1

Introduction
2006-09 preoperative axillary assessment data was published by Cardiff and Vale University Healthboard in 2010. Subsequently, the threshold for sampling axillary nodes was lowered and core biopsy as well as FNA used for sampling. 2015 data has now been compared to the previous data to determine the effect of these changes in practice.

Method
In 2015, 231 patients with invasive breast cancer underwent axillary ultrasound (AUS). Any node identified with cortical thickness greater than 2mm was sampled, either by CB or FNA. Patients with a diagnosis

of positive axillary nodes preoperatively proceeded to axillary nodal clearance (ANC). The remainder underwent sentinel node biopsy (SNB). The accuracy of preoperative AUS was evaluated and compared with the previously published data.

Results

Overall 74 (32%) of the 231 patients was node positive. Of these, 39 (52.7%) were identified preoperatively and therefore avoided unnecessary SNB. Preoperative axillary assessment had sensitivity of 52.7%, accuracy of 84.8%, and specificity of 100% in detecting axillary nodal metastases. This shows an improvement compared to previous data where sensitivity was 28.5% and accuracy was 80.5%. Specificity previously was also 100%.

Conclusion

Lowering the threshold for sampling axillary nodes from greater than 3mm cortical thickness to greater than 2mm, together with use of CB, has resulted in improving sensitivity of preoperative AUS from 28.5% to 52.7%, thus saving a further 24.2% of patients with invasive breast cancer from undergoing unnecessary SNB and possible two stage surgical treatment of the axilla.

PB.2

Enhanced pre-operative axillary staging using intradermal microbubbles and contrast enhanced ultrasound in breast cancer patients at Maidstone Hospital: Test performance of individual radiologists

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Breast Cancer Research 2017, **19(Suppl 1):**PB.2

Introduction

Sentinel lymph nodes (SLN) can be identified and biopsed in the breast clinic using intradermally injected microbubbles and contrast-enhanced ultrasound (CEUS). We aimed to investigate the technical performance of 7 individual radiologists at Maidstone Hospital.

Methods

1361 consecutive patients were identified from a prospective database of patients who had a microbubble/ CEUS guided SLN core biopsy between December 2010 and November 2016.

Results

The total number of cases performed by each radiologist were 276, 37, 501, 81, 116, 207 and 11. In 12 cases the data was incomplete and the name of the radiologist was not recorded. For radiologist number 1, one successful procedure was a fine needle aspiration biopsy rather than a core biopsy. The percentages of procedures with successful visualization of SLN were 97.5%, 89.2%, 91.2%, 72.8%, 81%, 90.3% and 90.1% respectively. The percentage of procedures with successful retrieval of lymphoid tissue were 99.6%, 97%, 86%, 96.6%, 89.4%, 90.4% and 71.2% respectively. In total, the successful visualization and core biopsy of SLN were 97.1%, 86.5%, 78.4%, 70.4%, 72.4%, 81.6% and 64.1% respectively.

Conclusions

Radiologists from the same institution showed wide variation in ability to visualize and core biopsy SLN suggesting that there are separate competencies for each part of the procedure. Defined protocols, standard setting and training may address this problem. In addition, advances in the technology of CEUS such as ultrafast ultrasound, super-resolution imaging and enhanced lymphatic microbubble transit may facilitate consistent identification of SLN to improve overall test performance.

PB.3

Accuracy of US guided pre-operative axillary staging in invasive lobular breast cancer: 3-year audit from a District General Hospital

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Breast Cancer Research 2017, **19(Suppl 1):**PB.3

Background

In the era of rapidly evolving management of breast cancer, imaging plays a vital role in detection and staging. It has been postulated that invasive lobular cancer (ILC) produces minimal desmoplastic response with little architectural distortion, hence posing a diagnostic challenge. With this complexity in mind, we aim to retrospectively audit the pre-operative accuracy of axillary US (AUS) assessment of nodal disease in ILC.

Method

We retrospectively audited patients with ILC over the last 3 years from 2014 to 2017 at our institution. All ILC were identified via pathological coding system. Postoperative histopathological results from sentinel lymph biopsy or axillary lymph node dissection were compared retrospectively with preoperative AUS +/- FNA.

Results

A total of 97 ILC with preoperative AUS assessment were reviewed. All patients were female (age range of 39-90, mean 63). AUS was negative in 60% (58/97) and suspicious in 39% (38/97). Within the negative AUS group, 27 were false negative (27/58). Of the false negatives, 85% (23/27) consisted of N1 micromet or N1 axillary disease. We were able to completely exclude N3 (0/27) disease although 15% (4/27) of N2 disease were not detected pre-operatively via US.

Conclusion

Pre-operative AUS assessment in ILC can be reliably used to exclude extensive N3 nodal disease. However, those with negative AUS should be interpreted with caution given the small proportion of N2 false negative result. Future studies comparing accuracy of AUS between invasive ductal cancer and ILC would be valuable.

PB.4

A systematic review and meta-analysis comparing the diagnostic accuracy of Fine Needle Aspiration (FNA) versus Core Needle Biopsy (CNB) for diagnosing Lymph Node Metastases in breast cancer

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Breast Cancer Research 2017, **19(Suppl 1):**PB.4

Introduction

In the post ACOSOG Z011 era, lymph node status remains a significant prognostic factor in breast cancer. To avoid unnecessary morbidity from axillary node clearance, accurate preoperative staging of the axilla is essential. We aimed to compare the diagnostic accuracy of Ultrasound (US) guided Fine Needle Aspiration (FNA) and US guided Core Needle Biopsy (CNB) for axillary staging.

Methods

A comprehensive search of published studies was performed on Medline, Embase and Scopus. Studies were included if comparison of FNA and CNB for axillary staging was performed with reporting of sensitivity and specificity for each test. Meta-analysis was performed using a random-effects model. Pooled sensitivity and specificity of FNA and CNB were calculated and summarized in forest plots.

Summary receiver operating characteristic (sROC) graph was also created to confirm diagnostic accuracy.

Results

Six studies describing 1,239 patients were included in the final analysis. Sensitivity and specificity of CNB was (89.2% and 100%) higher in comparison to FNA (69.8% and 99.5%). The positive prediction value (PPV) and negative prediction value (NPV) for CNB and FNA was 100%/87.1% and 99.4%/77.4% respectively. Although reported complication rates are higher in CNB (2% versus 5%), this was not statistically significant (p>0.05).

Conclusion

US guided-CNB is a superior diagnostic technique compared to US guided FNA for axillary staging in breast cancer.

PB.5

Understanding the signs of malignant breast tumours on magnetic resonance imaging

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Breast Cancer Research 2017, **19(Suppl 1):**PB.5

Purpose

To investigate the presence of definitive signs of breast masses (malignant / benign) such as hook sign, comet tail sign, root sign and blooming sign on dynamic contrast enhanced breast magnetic resonance imaging (MRI) and to investigate the prevalence and predictive values of these signs.

Materials and Methods

One hundred patients with a mean age of 46.24±11.25 years who had biopsy proven malignant lesion of the breast were included in this retrospective study. The signs were evaluated on breast MRI. Sensitivity and specificity of the MRI signs were calculated using Student's t test, Mann Whitney U, Pearson, chi-square test, Fisher, Freeman, Halton Test and Yates' continuity correction test.

Results

Positivity of hook sign, comet tail sign, root sign, blooming sign and heterogeneous enhancement was statistically significantly higher in malignant lesions when compared to benign ones (p=0,001; p<0,01). In the determination of malignancy; the ROC area value for root sign was highest with a value of 0,870. The sizes of lesions with positive hook sign and blooming sign were found to be statistically significantly higher when compared to those that were negative (p=0,010, p=0,041). The sizes of lesions with positive root sign and comet tail sign were found to be higher when compared to those that were negative, however this difference was not statistically significant (p=0,063, p=0,056).

Conclusions

For malignant breast lesions, the most sensitive breast MRI sign is the "root sign" and the most specific breast MRI sign is the "hook sign". These signs could be used for radiological-preoperative diagnosis.

PB.6

Breast MRI - how does the provision of increased information impact patient experience?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.6

Introduction

Internet chat boards, patient support groups, and anecdotal reports from clinical teams frequently indicate that breast MRIs are unpleasant for the women who have them. A team at North Bristol Hospital Trust (NBT) undertook a qualitative study to see whether newly developed resources improve women's experience of breast MRI.

Methods

1. Members of the Breast Cancer Support Charity (BUST) and Local Public Patient Involvement groups spoke with the NBT breast team to gain an insight into women's experience of MRI and suggestions improvements
2. A Breast MRI leaflet and video was co-produced by the clinical team (including radiologists, psychologists) and BUST

The impact of the resources was evaluated via a series of interviews. Fifteen were conducted prior to release of the new leaflet and video and a second set (n=15) following their release. Thematic analysis was undertaken evaluating the difference resources made to patient experience.

Results

The factors identified for inclusion in the new resources were; placement of the cannula, that women are required to lie supine, that their breasts would be exposed and manipulated, and the noises made by the MRI scanner. The leaflet also included a number of coping strategies that women could use before and during the MRI. Changes in women's reported experiences were found between the two groups of interviewees. Themes will be presented with qualitative examples.

Conclusion

Access to increased information and enhanced understanding of the process of having a breast MRI scan has a positive effect on women's subsequent experience.

PB.7

Utility of targeted ultrasound for MRI detected incidental enhancing lesions

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MRI breast is performed for variety of benign and malignant indications. 143/378 MRIs from 2014-2015 performed at SWBH required second look ultrasound: 28 were two area, 37 contralateral, 6 opted for mastectomy.

Results

Lymph node:
Ipsilateral: 11x U1-5 – Concordant biopsy and histological findings.
3x U1-3-benign histology at biopsy and malignant histology in final specimen. Localisation using ultrasound for the abnormal MRI node may be the limitation here.
Contralateral: 8 x U1-4 – Benign histology and follow-up 1-2yrs.
Breast:
Ipsilateral:
83x U1-5 – Concordant biopsy and histological findings.
1x U1 which on mastectomy revealed two foci of INST 22mm and 8mm. It is unclear whether this smaller focus corresponded to MRI which lesion which triggered the second look.
Contralateral: 28xU1-4 – Benign histology and follow-up 1-3yrs.
1x U1-had stereo biopsy which found a true incidental contralateral malignancy, not detectable on ultrasound but seen retrospectively on mammography

Conclusions

MRI has good correlation with size of invasive component and sensitive at detecting additional pathology. Addition of second look ultrasound increases accuracy of imaging to 97% with final histology.
22 ultrasounds changed operative management to mastectomy.

- Most common reason for down grading imaging findings was sclerosing adenosis.
- Abnormal morphology nodes are likely to be malignant despite size

Limitations: No separate MRI grading for lymph nodes exists to help correlate with ultrasound suspicion. Most cases were followed up for 1-3 years. We do not routinely follow up lymph nodes with dedicated imaging.

PB.8

The accuracy of 3T MRI in evaluating tumour size when compared with histopathology in patients with newly diagnosed breast cancer

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Breast Cancer Research 2017, **19(Suppl 1):**PB.8

Introduction
Study to evaluate the accuracy of 3T MRI in evaluating tumour size in patients newly diagnosed with breast cancer and to assess the possible causes of over/underestimation of disease on MRI.
Methods
Retrospective study over 1.5 years of newly diagnosed breast cancers staged with preoperative 3T MRI. Patients requiring neoadjuvant therapy were excluded. Imaging was reviewed by a consultant breast radiologist, histopathology reports obtained from HIS. Study points included final histopathology; presence of significant background enhancement at MRI; and comparison of tumour size at MRI and histopathology with a discrepancy in size of 10 mm or less taken as concordant. Study included **61 patients** with **66 tumours**.
Results
58/66(88%) tumours demonstrated size concordance.
5/66(7.5%) tumours overestimated-**2** associated with extensive LCIS and **1** with extensive DCIS at histopathology; **1** associated with extensive background parenchymal enhancement**; 1** had a total imaging/histopathology discordance of only 11mm. Their surgical management was not adversely influenced by size overestimation at MRI, and 3 actually required re-excision of margins.
3/66 (4.5%) were underestimated-image interpretation was limited by extensive background enhancement for all and **all** were occult on conventional imaging**.**
Conclusion
Our study demonstrates higher rates of tumour size concordance at MRI and histopathology than is currently recorded in the literature, likely due to our routine use of 3T MRI.
We suggest that extensive LCIS present at histopathology may lead to overestimation of tumour size on MRI, while the extent of tumours that are occult on conventional imaging can be underestimated.

PB.9

Second look ultrasound in MRI screen detected breast lesions in high risk patients on the NHSBSP: a single centre experience

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Introduction
Contrast enhanced breast MRI for screening women at high risk of breast cancer has a high sensitivity. Patients who present with MRI screen detected lesions are recalled for second look ultrasound. We evaluate the value of targeted second look ultrasound at a UK district general hospital.
Method
A retrospective review of imaging was made of patients on our high risk database who underwent annual MRI surveillance from 2004 to 2016.
Results
There are currently 95 patients on our database which include those with BRCA 1 or 2 mutations and who received supradiaphragmatic radiotherapy under the age of 30. Of these, 30 patients had 39 breast lesions detected on MRI. 38 lesions were recalled for second look ultrasound; 1 lesion had short interval MRI follow up. 33 lesions had a corresponding ultrasound abnormality with 20 proceeding to ultrasound guided core biopsy and 1 to fine needle aspiration. The remaining 12 lesions appeared benign on ultrasound and were either cysts that were aspirated or lesions smaller/stable on follow up MRI imaging. Of the 5 lesions not seen on ultrasound, one underwent MRI guided biopsy, two had short interval MRI follow up, one proceeded directly to bilateral mastectomy and one was lost to follow up. The overall sampling rate was 23.2% and cancer detection rate was 5.3%.
Conclusion
Targeted second look ultrasound is an effective approach for high risk patients presenting with MRI screen detected lesions. There should be a low threshold for biopsy in this patient population.

PB.10

Hypoxia in ER+ breast cancer: a study using combined PET/MR imaging

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Breast Cancer Research 2017, **19(Suppl 1):**PB.10

Hypoxia is considered one of the factors implicated in treatment resistance in ER+ breast cancer. Here, we investigate hypoxia/vascularity in ER+ breast tumours using combined FMISO-PET/MR imaging.
Imaging was performed using a GE Signa PET/MR scanner on female patients with ER+ breast cancer scheduled for primary surgery. After a 120-min uptake period following FMISO injection, a 60-min simultaneous PET/MR scan was performed. PET data were analysed by SUV_{max}, and Patlak K_i using a population arterial input function. Tumour hypoxic fractions were estimated as the percentage of voxels with values >2SD of the mean of normoxic muscle on PET images. K^{trans} was derived from DCE MRI using the standard Tofts model. Relationships between imaging and pathology data were assessed using linear regression with tumour type, grade, size, stage, nodal and necrosis status as covariates.
Results
10 patients/12 lesions were assessed. Tumour hypoxic fractions ranged between 0-11%. 40% of the lesions were hypoxic on SUV, and 70% on K_i images. Moderate, not significant correlations were observed between K^{trans}, SUV_{max} and K_i. Strong dependence between pathology stage, K^{trans} and SUV_{max} (p=0.025; 0.001) was observed. Tumour necrosis, type and size were significant predictors of K_i (p=0.032; 0.008; 0.006 respectively). No significant relationships between pathology and hypoxic fractions were found.
Conclusion
FMISO-PET indicated presence of hypoxia in ER+ breast cancer. Tumour necrosis, type and size were strong predictors of hypoxic status. Dependence between stage and vascularity was observed.

PB.11

Pictorial review: correlation of abnormal MRI breast findings with second-look ultrasound and biopsy results in order to reduce the recall rate for high risk screening MRI

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Introduction
NHSBSP guidance states that the recall rate following high risk screening MRI should not exceed 7% (minimum standard<10%). Our recall rate exceeds this, therefore we have correlated MRI characteristics of lesions with subsequent ultrasound and biopsy results to ascertain if there are features to consider when aiming to reduce unnecessary recalls.

Methods
High risk MRI performed between March 2016-June 2017 at SWLBSS were identified using Radiology Information Service. Imaging and reports from patients undergoing second-look US were reviewed. Electronic Patient Record system was used to identify biopsy results.
Results
182 high-risk screening MRIs were performed during the audit period. 26 (14.3%) patients were recalled for second-look ultrasound.
Patients were mostly called back on the basis of foci of enhancement that were either new and concerning or enlarging; and exhibited a range of morphological features (ranging MRI 2–MRI 4) and enhancement profiles.
11 of 24 patients who attended underwent biopsies based on ultrasound appearances (six U3 lesions, the remainder were U1/2). 13 ultrasounds were normal.
Histology yielded one B3 papilloma only.
One patient with a U1 ultrasound but significant MRI 3 abnormality had B5a DCIS at MRI guided biopsy.
Conclusion
The sensitivity of breast MRI results in a proportionally high number of patients being recalled for second-look ultrasound/biopsy unnecessarily. Reviewing the criteria and increasing the stringency for what qualifies as a concerning lesion at MRI may help to reduce inappropriate recall and workload in busy breast units.

PB.12

Diagnostic performance of an academic breast screening centre: Enhancing lesions detected on staging and surveillance breast MRI

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Background
Although specific audit measures do not exist for Breast MRI reporting, there are performance measures in the literature for screening and diagnostic Breast MRI that include detection rate and positive predictive value.
Objective
To evaluate the performance of Breast MRI in our institution in diagnosing:
1 - occult non-index lesions prior to surgery in patients newly diagnosed with breast cancer
2 - breast cancer in patients with a family history
Method
We retrospectively reviewed 147 staging and 70 surveillance MRIs performed from January –December 2016. We identified MRIs with enhancing lesions that scored MRI 3-5, and that were non-index lesions in the preoperative group. MRIs were correlated with second-look ultrasound (SLUS) and histopathology. Our performance outcomes were measured against the literature.
Results
Pre-operative MRI:

- 41 patients; 46 lesions
- Additional lesions detected in 28% patients; 15% of the lesions were malignant
- PPV 15%

Screening MRI:

- 13 patients; 14 lesions
- Recall rate 19%
- Detection Rate 2.8%
- PPV 14%

Conclusion
Our MRI detection in the preoperative group is comparable with the literature. Our recall rate for screening patients is double the NHSBSP recommendation, but our detection rates for screening patients are in line with rates reported in the literature. The MRI3 lesions had concordant findings on SLUS. Our audit supports the high sensitivity of MRI in picking up abnormal enhancement and its diagnostic value in MRI 3/4 lesions.

PB.13

Clinical performance of digital mammography systems in a breast screening program – an update

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The purpose of this research was to compare the clinical performance of three individual digital mammography (DM) systems utilised within a population based screening program. The results presented here expand on previously published data from a 3 to a 9 year period.
Methods
28 DM systems from three different vendors were involved in the study. The retrospective analysis included 971612 screening examinations of females aged between 50 and 64 years. All images were double read and assigned a result according to a 5 point rating scale to indicate the probability of cancer. Women with a positive result were recalled for further assessment imaging and biopsy if necessary. Clinical performance in terms of cancer detection rate was analysed and the results presented.
Results
A total of 5262 cancers were diagnosed. No statistically significant difference was found between the three individual mammography systems in terms of overall cancer detection rate or in the detection of invasive cancer and ductal carcinoma *in situ*. This was shown in both prevalent and subsequent screening examination categories.
The results demonstrate comparable cancer detection performance for the three imaging system types. The study expansion from a 3 to a 9 year period provided sufficient numbers of cancers, 5262 (n=971612) compared to 1632 (n=238182) in the original study, to prove statistical significance.
Conclusion
Overall the results provide a reassuring audit measure, suggesting that technical differences evident from routine quality assurance measurements do not appear to be reflected clinically in terms of overall cancer detection.

PB.14

Study to assess the accuracy and feasibility of breast surgical specimen margin assessment with tomosynthesis compared to digital mammography and histology

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Introduction
Digital Breast Tomosynthesis (DBT) is an increasingly utilised technique to image the breast. This prospective study was performed to see if it is possible to use DBT to analyse surgical breast specimens and determine if the size of the lesion and proximity to the surgical margin could be better assessed with DBT compared to full field digital mammography (FFDM).
Methods
This prospective study assessed 40 patients who underwent local excision of either ductal carcinoma in-situ (DCIS) or invasive breast

carcinoma. The specimens were sent from theatre for FFDM and DBT (3D planes and synthetic 2D images). The size of the lesion and the closest distance to the margin were determined for both the FFDM and DBT images. Concordance was agreed by two breast radiologists, and the DBT images were reviewed at least 4 weeks post the corresponding FFDM images. The quality of the DBT 3D and the synthetic 2D images were compared to the FFDM images with a 5 point scoring system.

Results

There was no significant difference between the final histological size or in detection rates of involved margins when comparing FFDM to DBT. The DBT 3D and synthetic 2D images were judged to be better quality than the FFDM images (+1.72 score, P<0.01 and +0.52, P<0.01 respectively).

Conclusion

There was no significant difference between DBT and FFDM in assessing tumour size and margin involvement. It is possible to assess breast specimens with DBT and the image quality was demonstrably higher.

PB.15

Can mammography be avoided in women aged 35-39yrs referred to the symptomatic breast service?

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Introduction

Increasing numbers of young women are presenting to symptomatic breast clinics with a resultant increase in demand on the radiology service. Guidance with regards to the use of mammography in women aged 35-39yrs is variable. We reviewed the presentation of all breast cancers in women aged 35-39yrs.

Method

Data was collected retrospectively for women aged 35-39yrs with a new breast cancer diagnosis over a 5 year period within a Scottish NHS board. The electronic patient record was reviewed to ascertain presenting symptom, clinical code, imaging findings, imaging codes and pathology.

Results

53 women were diagnosed with breast cancer. 52 women underwent mammography and ultrasound imaging; 1 patient had mammography alone. 41 (77.4%) patients were assigned clinical code 3-5. Of these all had USS code 3-5 and therefore diagnostic biopsy. 11 (20.8%) patients were assigned clinical code 2. Of these 9 had USS code 2-5 and therefore diagnostic biopsy performed. 2 patients with U1 code underwent further biopsy (1 clinical; 1 stereotactic) and were diagnosed with DCIS. 1 patient with clinical code 1 had incidental microcalcification on mammography (code 5).

Conclusion

Only 1 patient over the 5yr period was diagnosed with DCIS in the absence of clinical and/or USS findings that would have indicated a biopsy. In the vast majority of women aged 35-39yrs breast cancer will be identified using clinical assessment and ultrasound alone.

PB.16

Can 2D synthesized (C-View™) images be used in isolation for diagnosing breast malignancy without reviewing the entire Digital Breast Tomosynthesis data set?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.16

Aims and Objectives

The aim of this study was to determine if the 2D synthesized (C-View™) acquired at digital breast tomosynthesis (DBT) would give adequate information to confirm a malignancy and obviate the need to review the entire tomosynthesis image data set.

Methods

All patients with biopsy proven breast cancer recalled from screening mammograms between May and September 2016 were included. The screening mammogram, the C-View™ and DBT images were reviewed by 3 breast radiologists and each assigned a BIRADS code. Discrepancies were reviewed and resolved by consensus.

Results

92 patients were diagnosed with breast cancer in this time period, after exclusion 83 lesions in 78 patients were assessed.

In 27 cases, the BIRADS code remained unchanged for all 3 modalities. In 16 cases the lesions appeared more concerning on 2D synthesized (C-View™) and DBT than on the original mammogram but were not definitive for malignancy (BIRADS 4). In 29 cases, a BIRADS 5 code was assigned on 2D synthesized (C-View™) and tomosynthesis but not on 2D. For 11 lesions a BIRADS 5 code was assigned only on DBT.

Four women had BIRADS 5 lesions seen on both the 2D Synthesized (C-View™) and DBT that were not seen on the screening 2D mammogram. One of which was multifocal.

Conclusion

While the 2D synthesized (C-View™) gives additional information compared to a screening 2D mammogram, the full DBT tomosynthesis data set needs to be reviewed to confidently diagnose breast malignancy.

PB.17

False negative cases of Contrast Enhanced Spectral Mammography (CESM) in histologically proven breast malignancy: is reporter misinterpretation a factor?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.17

Aim:

To establish whether misinterpretation of CESM imaging is a factor in cases of discordance with MRI and final histology.

Method:

A retrospective review was undertaken of 65 patients who underwent both CESM and MRI. Evaluation of the MRI and CESM reports to identify those patients with a negative CESM but positive MRI and histology. CESM imaging was reassessed to see if initial reports misinterpreted the findings.

Results:

Three cases were identified with false negative CESM and positive MRI and subsequent histology.

Case 1: Ultrasound detected solid lesion.
CESM: solitary enhancing lesion.
MRI: Multiple areas of suspicious enhancement.
Second review of CESM: equivocal.

Case 2: Indeterminate microcalcification on mammography.
CESM: No abnormal enhancement.
MRI: Extensive, branching, non-mass enhancement.
Second review of CESM: misinterpretation.

Case 3: Ultrasound detected distortion. Occult on conventional mammography.
CESM: No abnormal enhancement.
MRI: Bilateral abnormal enhancement.
Second review of CESM: correct interpretation.

Conclusion:

CESM had decreased sensitivity of breast cancer detection compared to MRI in 5% of our cases. Reporting misinterpretation was a factor in the false negative cases. CESM is a new technique and image

interpretation is an evolving skill that requires continued evaluation. This study is limited by the small case numbers and further evaluation on a larger scale needs to be undertaken.

PB.18

Microcalcification on screening mammograms—benchmarking the workload risk stratification and morphology can help identify cases with high PPV

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Breast Cancer Research 2017, **19(Suppl 1):**PB.18

Introduction
There is good correlation between BI-RADS categories with final histology in predicting malignancy. Positive predictive values (PPVs) can be correlated with BI-RADS categories. We wanted to determine in West Scotland Breast Screening Centre, how well casting (2a) and non-casting (2b) calcifications correlated with malignancy and surgery.
Methods
We determined number of patients recalled from 01/04/2015-31/03/2016, number recalled for calcifications and proportion yielded. PPVs for malignancy/surgery for categories 2a, 2b and all microcalcifications were determined.
Results
Of the 3192 patients recalled, 48 were casting whilst 386 were non-casting, giving percentage of (386+48)/3192x100%=13.60%.

	Calcification type	PPV (%)
Malignancy (B≥5)	2a	94.4
	2b	39.3
	2a+2b	46.6
Surgery (B≥3)	2a	94.4
	2b	43.9
	2a+2b	50.6

Suspicion level		Number	B≥3	B≥5	PPV surgery B≥3 (%)	PPV malignancy B≥5 (%)
R2	2a	0	0	0	N/A	N/A
	2b	3	1	1	33.3	33.3
R3	2a	5	3	3	60.0	60.0
	2b	202	72	60	55.4	29.7
R4	2a	12	12	12	100	100
	2b	26	24	22	92.3	84.6
R5	2a	19	19	19	100	100
	2b	8	8	8	100	100

Summary
2a calcifications had high specificity for malignancy and surgery with PPVs 94.44% whilst 2b was lower at 39.3% and 43.9%. PPV for malignancy is lowest for category R3 2b (29.7%) which is too high to risk not recalling hence we should keep our current practice.

PB.19

Evaluating performance of automated breast density algorithms – when correlation is necessary but not sufficient

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Breast Cancer Research 2017, **19(Suppl 1):**PB.19

Introduction
All automated breast density algorithms are ultimately evaluated based on how well they perform compared to expert radiologists' assessments. This study evaluated the association and agreement of percent mammographic density (PMD) assessments between a consensus of expert radiologists' assessments and two fully automated algorithms (Densitas DM-Density and Libra).
Methods
Three expert radiologists visually assessed PMD from digital mammograms from two vendors (Hologic: n=344; GE: n=413). Additionally, PMD was evaluated using two different fully automated methods. Linear association, quantified by Pearson Correlation Coefficient (PCC), and agreement, quantified by Intraclass Correlation Coefficient (ICC), were measured between the three raters' (radiologists, Densitas, Libra) density assessments, by digital mammography machine vendor (Hologic/GE) and view (CC/MLO).
Results
There was a strong to very strong linear association (PCC=0.88-0.93) and almost perfect agreement between radiologists' and Densitas' PMD assessments (ICC=0.87-0.92). There was a strong linear association but only slight to fair agreement between radiologists' assessment and Libra PMD assessments (PCC=0.74-0.83 versus ICC=0.21-0.32) and between Densitas DM-Density and Libra (PCC=0.75-0.85 versus ICC=0.16-0.33).
Conclusion
When evaluating the performance of mammographic density algorithms against expert radiologists, it is critical to determine the measures of agreement (ICC) in addition to linear association (PCC). The PCC alone is necessary but not sufficient to establish face validity of algorithm-generated PMD measures; the ICC provides the critical assessment of agreement required.

PB.20

Are radial scars more frequently identified in breast cancer screening since the introduction of digital mammography and tomosynthesis and has their association with malignancy changed as a result?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.20

Breast Test Wales (BTW) introduced digital mammographic screening in January 2012 and tomosynthesis in assessment. This retrospective audit of prospectively collected data determines: the incidence of radial scars diagnosed since the introduction of digital mammography; if the rates of associated atypia and malignancy differ from those reported previously in the analogue age; and if the subtlety of the mammographic lesion influences these factors.
Women included in the study had histologically confirmed radial scars from BTW SE Wales between 1st January 2012 and 31st December 2016 and between 1st January 2007 and 31st December 2010 for an analogue comparison group.
Data analysed included patient age; presence of atypia; subsequent cancer diagnosis including histology.
All included radial scars were assigned a subtlety score from S=1 (most subtle) to S=4 (very obvious). S=0 represented radial scars not visible on mammography but a later incidental finding.
The average number of radial scars found 2012- 2016 (digital) = 33.2; the average for 2007-2010(analogue) = 19.2.The associated malignancy rate =13.5% for digital cohort; 10.4% for analogue cohort. The highest malignancy association was identified incidentally following biopsy for micro-calcification (S=0).
Low grade DCIS proved to be the most associated malignancy. Lesions over 40mm had highest upgrade to malignancy.
Radial scar frequency has increased since digital mammography was introduced but the associated malignancy rate remains similar to analogue and with no clear association of subtly and upgrade to malignancy, indicates there is no resultant decrease in their significance.

PB.21

Is there a difference in reading time when normal and abnormal DBT cases are examined by DBT experienced radiologists?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.21

One of the main challenges of implementing digital breast tomosynthesis (DBT) into the UK screening programme is the known increased time to read DBT than digital mammography (2D) cases. We investigated in detail the nature of reading normal and abnormal DBT images by a group of experienced DBT radiologists to determine if there were image inspection time differences. 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 and pad control were recorded. All participants read the cases as an initial 2D overview followed by DBT views. Excluding any reporting time, they spent an average of 1:05s on each case, comprising 14s reading the initial 2D overview and then 51s examining the DBT view, (p=0.001). There was no significant difference in overall reading time between normal (1:03s) and abnormal cases (1:07s, p=0.53) and little difference in reading time for the 2D overview for either normal (15s) or abnormal cases (13s, p=0.1335). Additionally there was no significant difference in time for normal (48s) and abnormal cases (54s, p=0.3411) when these were examined as DBT images. It is concluded that a similar image inspection time is found, irrespective of whether a case is normal or abnormal. The image inspection times here are faster than previously have been reported by very experienced DBT readers.

PB.22

Primary locally advanced breast cancer: Correlation of mammographic changes post neoadjuvant chemotherapy with Miller Payne Score

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Breast Cancer Research 2017, **19(Suppl 1):**PB.22

Purpose
To assess concordance of mammographic changes post neoadjuvant chemotherapy (NAC) with pathological Miller Payne Score.
Background
Performing mammographic tumour evaluation before and after NAC allows radiological assessment of tumour response to treatment prior to surgical excision. The Miller Payne (MP) Score is a histopathological five-point grading system which assesses tumour response to NAC. This is an independent predictor of overall patient survival.
Materials and methods
Retrospective data were collected on all patients who completed NAC in our centre in 2016 (N=41) for breast carcinoma. Patients underwent mammography before and after NAC, prior to surgical tumour excision. Mammographic response was measured by calculating the difference between maximum tumour diameter pre and post NAC.
Results
100% of patients (N=11) who had pathologic complete response, or MP grade 5 response (no malignant cells identifiable), had mammographic complete response. Mean mammographic tumour reduction in patients (N=7) with MP grade 4 response (greater than 90% loss of tumour cells) was 83%, in patients (N=9) with MP score of 3 (30-90% loss of tumour cells) was 75%, in patients (N=12) with MP score of 2 (0-30% tumour loss) was 25% and in patients (N=2) with MP score of 1 (no loss of tumour cells) was 33.5%.
Conclusion
Mammographic response correlates with pathological response in patients with MP score of 5, however similar correlation does not exist in other MP scores. Larger studies incorporating other imaging modalities would be useful.

PB.23

To biopsy or not to biopsy - is routine biopsy of all R3 breast lesions in patients aged 25-30 required?

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Introduction
Study to evaluate the imaging appearance/histology of all biopsied breast lesions in patients 25 to 30 presenting over six years. As per national guidelines, typical appearing R3 lesions <3 cm in patients <25 years are not routinely biopsied. We hoped to increase that age limit to 30.
Methods
Retrospective study of patients aged 25-30 presenting for TAC over 6 years, allocated a score of R3, R4 or R5. **534** patients reached criteria. Study points included radiology score; imaging features (fibroadenoma-like/non fibroadenoma-like; size; atypical features); histology.
Results
25/534 (4.6%) allocated R4, R5 or R3/R4. **14 (2.6%)** of these diagnosed with invasive malignancy.
509/534 (95.3%) allocated a score of R3.
502 of these proceeded to biopsy.**1** with score R3 demonstrated invasive malignancy on biopsy histology, however the lesion demonstrated atypical appearances on review of imaging.
50/534 (9.3%) allocated a score B3 and proceeded to excisional biopsy. None of these lesions demonstrated invasive malignancy. **5 (0.8%)** Phyllodes in total diagnosed, **4 < 3cm.**
If this was our routine practise, we would **NOT** have missed an invasive cancer. We would not have initially diagnosed 4 phyllodes tumours < 3cm, however their natural history suggests these patients would have re-presented with an enlarging mass.
Conclusion
We suggest that in patients aged 30 or less where a "fibroadenoma-like" R3 lesion demonstrates a typical benign appearance, initial biopsy could be avoided and clinical follow-up following appropriate counselling could be employed.

PB.24

Time course of development of breast cancer in patients with B3 lesions associated with a longer term risk of developing cancer

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Introduction
At present many breast units, including ours, undertake annual mammography for 5 years in patients with B3 lesions associated with a longer term risk of developing cancer (risk lesions), but the optimal frequency and length of surveillance is unclear. We have reviewed the development of cancer in a group of our patients with risk lesions undergoing surveillance.
Materials and Methods
Retrospectively from the hospital appointments database we identified all patients with risk lesions undergoing surveillance mammograms from April 2010 to the end of March 2015 and reviewed their records until the end of March 2017. At this time diagnosis was made by 14G core biopsies combined with 10G vacuum-assisted biopsy or diagnostic excision to exclude adjacent co-existing malignancy.

Results
We identified 50 patients with risk lesions diagnosed between 2005 and 2014. At diagnosis average age was 55.9 years (range 37.5 to 75.0 years). Pathological diagnosis was ADH in 29 (58%), classical lobular neoplasia in 14 (28%) and other risk lesions in 7 (14%). By the end of March 2017, average time since diagnosis was 6.1 years. 4 (8%) had developed breast cancer. 3 were diagnosed following surveillance mammograms at years 2, 3 and 4 respectively. The fourth was diagnosed incidentally when she came to a symptomatic clinic with a cyst 10.9 years after diagnosis.
Conclusion
In our unit, 4/50 (8%) patients with risk lesions have developed breast cancer, 3 of them diagnosed within 5 years of diagnosis as a result of surveillance mammograms.

PB.25

How long is the wait?

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Introduction
Medway Breast Screening covers a population of 110,000 ladies in the age range of 47 - 73 years .We were in a challenging position and underperforming (bottom 3 out of 23) South of England . Hence were not able to provide results on time. The 90% achievable standard for women who attended an assessment centre within 3 weeks wasn't met. We were only 41% in 2014/2015. This resulted in negative publicity, patient anxiety and several complaints. We were closely monitored and questioned by NHS England. We needed to work harder to turn this around. Ongoing audit started in 2015 to ascertain the reasons for the delay and proffer solutions to ensure high quality care and excellent outcome.
Key results compared to standards
Audit results in Sept 2015 showed DOFOA (date of first offered appointment) was 84% and screen to assessment 69%. Standard > 90%.
Methods
Process comprised designing Waiting Time Performa for achieving reasonable targets. Training the staff groups for the audit. Documenting comments regarding delays at all stages followed by statistical analysis of the data and formulating an audit report.
Actions
New equipment, Skill mix, training opportunities, robust rota, processes preventing breaches. Reducing recall rate. Reviewing complaints. Forward planning, effective communication. Reducing patient's visits for best clinical outcome. Working cohesively as a team.
Result
We are now in the top 3 performing units. Since last year (2016) our stats are as follows DOFOA from 84% to 98.7% and screen to assessment from 69% to 93% in 3 weeks. We are persistently achieving 100 % DOFOA and 97 % screen to assessment National Standard > 90%.
Conclusion
Exceeding national standards, outstanding patient care, strong team binding, working within capacity constrains.

PB.26

A review of screen detected, small, grade 3 invasive cancers

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Breast Cancer Research 2017, **19(Suppl 1):**PB.26

Introduction
A well performing Breast Screening Unit will detect small invasive cancers less than 15mm, with a high positive predictive value and a low referral rate for assessment.
Aim
Our aim is to review and present the mammographic features of grade 3 cancers <15mm in diameter. This will highlight the appearance of these small, high grade cancers to ensure the detection rate remains high.
Methods
The KC62 report for the year 2015-16 was used to identify all invasive cancers <15mm in diameter. Each case was reviewed to classify the mammographic abnormality and visibility of the lesion as per the 'performs' criteria. It was also noted whether the mammographic abnormality was detected by a single or double reader, whether it was present on one or two views and the breast density as per the ACR BI-RADS classification.
Results
Our unit performed above the achievable national standards set by the NHS BSP. 184 cancers were detected <15mm in diameter, of which 25 were grade 3. All these were ductal type.
The most common mammographic abnormality was an ill-defined mass (15/25). The next most common was a spiculate mass (6/25).
The majority were detected by both film readers. Three cases were detected by a single reader only and these were all ill-defined densities.
Conclusion
The most common small grade 3 cancers were detected by both readers as an ill-defined mass ("smudge density"). Interestingly, over half of these were associated with faint microcalcification.

PB.27

Analysis of single reader screen-detected mammographic abnormalities which ultimately led to a breast cancer diagnosis: what are we missing?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.27

Introduction
Analysis of single reader screen-detected mammographic abnormalities which ultimately result in a breast cancer diagnosis can facilitate learning from patterns of under-recognition within a department.
Methods
Breast cancer diagnoses following a single reader detected abnormality between 01/04/2014 and 31/03/2016 were analysed. Information regarding background breast parenchyma, lesion morphology, size of abnormality and on which views visible and whether it was first or second reader detected were collated to ascertain any trends in under-recognition of abnormalities. Findings were correlated with the histological diagnosis following surgery.
Results
71 invasive breast cancers and 18 cases of ductal-carcinoma-in-situ were detected during the two year period. The majority were referred for arbitration by the second reader.
A wide variation in background parenchyma was demonstrated. 16% of the lesions were detected in type A, predominantly fatty breast tissue. Almost half the mammographic abnormalities were densities (45%), whilst quarter were either micro calcifications (25%) or distortions (24%). Most abnormalities were visible on both screening projections.
Histological analysis demonstrated a trend of underestimation of pathological size mammographically. 17% of lesions were greater than 20mm in size, and the majority of these included large areas of high-grade DCIS.
Conclusion
Reflection on practice is a fundamental tenet in modern day radiology. Through learning from our mistakes and identifying recurring pitfalls within our centre, we hope to improve our future screen reading and cancer detection. This must form part of ongoing continual review of practice and professional development.

PB.28

Long-term impact of the introduction of digital mammography in the Irish National Breast Screening Program

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Introduction
Full-field digital mammography (FFDM) has largely replaced screen-film mammography in breast cancer screening. The aim of this study was to review the long-term impact of FFDM on the diagnosis of invasive cancer and ductal carcinoma in situ (DCIS), in a population based cancer screening program.
Methods
This study included 1,054,838 screening examinations in women between the ages of 50 and 64 years of age from 2000 to 2014. FFDM was introduced to the Irish National Breast Screening Program from 2005 to 2007; 867,904 mammograms were performed using FFDM and 186,934 were performed using screen-film mammography. Invasive cancer and DCIS detection rates for initial (prevalent) and subsequent screening cohorts were calculated for FFDM and screen-film groups.
Results
There was no significant difference in cancer detection rate for FFDM and screen-film mammography in women undergoing their first screening mammogram, (6.8 vs 6.9 per 1,000, respectively; $p = 0.610$) or a subsequent screening mammogram (4.6 vs 4.6 per 1,000, respectively; $p = 1.00$). The DCIS detection rate was significantly higher with FFDM than screen-film mammography, 1.9 vs 1.6 per 1,000 respectively ($p = 0.04$) with initial screening examinations, and 1.2 vs 0.9 per 1,000 respectively ($p = 0.02$) in subsequent screening studies.
Conclusion
This study demonstrates the introduction of FFDM has resulted in a prolonged increase in the rate of DCIS detection over an 8 year period, with no associated change in the rate of invasive cancer detection.

PB.29

Interval breast cancers: a review of imaging findings in a UK breast unit

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Introduction:
Interval cancers represent breast cancers detected between routine 3-yearly breast screening mammograms. In line with NHS BSP recommendations, all interval cancers are identified and reviewed in our Trust and categorised 1 (normal/benign), 2 (uncertain), or 3 (suspicious features). We present a retrospective audit of imaging findings from our interval cancer reviews between May 2010 and March 2017.
Method:
All interval cancer review patients were identified from breast unit records. Imaging findings were reviewed, descriptive statistics performed.
Results:
570 females underwent interval cancer review; 134/570 were assigned grade 2 (131/134) or grade 3 (3/134).
7% (10/134) of imaging abnormalities identified as representing the known cancer on review involved microcalcification: 6% (8/134) microcalcification only, 1% (2/134) density with microcalcification.
92% (124/134) of imaging abnormalities identified did not involve calcification: poorly defined opacity (65/134), distortion of architecture (23/134), spiculated mass (11/134), asymmetric density (12/134), partially well-defined opacity (9/134), well defined opacity (4/134).
NHS BSP KC62 data for our Trust (2010-2016) demonstrate that non-invasive breast cancers represent 17% of cancers detected per annum, versus 83% invasive breast cancer.
Conclusion:
Findings, when compared to KC62 data, suggest over-representation of soft tissue density-related findings in our interval patients. This may be due to more difficult image interpretation with soft tissue densities, and/or due to different pathological processes involved, with soft tissue density cancers more likely than microcalcification to present clinically before the next screen.

PB.30

What is the optimal surveillance of B3 lesions? - a single centre experience

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In our institution B3 lesions are managed with vacuum assisted excision (VAE). Surgery is only indicated in cases of papilloma/radial scar with atypia; fibroepithelial lesions and if radiological or pathological concern after VAE. All lesions with atypia are recommended to have 5 year annual mammographic follow-up. B3 lesions with no atypia are discharged to routine screening. Those upgraded to cancer had 5-year follow-up. This audit assesses whether 5 year annual mammographic follow-up can be reduced.
B3 lesions identified from the Breast Screening programme from April 2009 to March 2016 were examined. Mammographic follow-up was documented from patient electronic records. Recalls and subsequent cancers were recorded.
561 patients were identified over 7 years. 218 (39%) were discharged to routine screening; 338 patients had annual 5-year mammographic surveillance and 5 patients lost to follow-up. 3/218 follow-up patients (1%) subsequently developed a cancer. All presented symptomatically with a new mammographic lesion. 19/338 (6%) follow-up patients developed a cancer (6%). 15/19 developed in patients with B3 diagnosis. 14/15 were detected on surveillance and 1/15 presented with symptoms. 53% of these were diagnosed in the first two years. 4/19 cancers developed in patients where B3 was upgraded to B5 and treated with therapeutic surgery.
The malignancy rate on subsequent surveillance is low (4%). The majority of cancers were identified on surveillance mammography. We suggest annual mammography for 2-years, then routine surveillance by the NHSBSP with 3-yearly mammography.

PB.31

In the digital era, can new masses in the incident round of mammographic breast screening be more clearly classified?

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Objective
Aiming for better classification of new or changed masses as benign in the incident screening rounds, thus reducing the recall rate and unnecessary benign biopsy rate. Can this be achieved despite reader concerns that invasive grade 3 or mucinous cancers can mimic benign lesions?
Methods
A retrospective study looking at prospectively collected data in SE Wales region from 1st January 2013 to 31st December 2016 to capture a whole screening cycle. All recorded incident rounds cases identified as a mass from NBSS with the histological outcome of benign (B2), grade 3 (G3) and invasive mucinous cancers (IMC) were reviewed and classified according to size, shape, density and margins.

Results
230 B2 (1.4/1000 screened), 55 G3 (0.3/1000 screened), and 21 IMC (0.1/1000 screened) were assessed on mammography. All G3 cancers possessed malignant features (poorly defined, high density, irregular); the majority of invasive mucinous carcinomas had atypical features (1 was oval). 178 B2 lesions were round or oval, 107 well defined and 98 had partly obscured edges; 135 were dense. Size of the lesion was not a good indicator for lesion classification.
Conclusions
Lesions presenting with typical benign features need not be recalled for assessment in the incident round even if new or increased. G3 cancers rarely have typical benign features and both G3 and IMC are rare events in screening. Increased reader confidence can reduce recall rates further and reduce unnecessary benign biopsies. Tomosynthesis in screening could further reduce recall particularly in cases of partially obscured edges.

PB.32

Guidelines on radiologically-guided percutaneous biopsy/ excision of breast lesions in patients receiving oral anticoagulants - old and new

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Introduction
The current national guidelines (BSBR) on patients receiving anticoagulant/ antiplatelet therapy who require imaging-guided breast intervention have been available since 2012 and form the basis for local guidelines across the country. The guidelines do not include the Newer Oral Anticoagulants (NOACs- Rivaroxaban, Dabigatran, Apixaban) or short-acting low molecular weight heparin (LMWH) preparations, and to our knowledge such guidelines are not available.
The purpose of this Quality Improvement project was to update the local guidelines in our institution to include the NOACs and LMWH preparations.
Methods
A literature review was performed on anticoagulants and percutaneous breast biopsy procedures, including NOACs. The local and national guidelines on anticoagulants and percutaneous intervention were reviewed. Specific advice was sought by the haematology department in our Institution. Our local guidelines were updated. The outcome was presented and discussed in our local Breast Directorate quarterly meeting, and implementation was agreed.
Results
NOACs: The timing of breast intervention depends on the needle gauge and type of procedure (14G core, 11G/10G/9G vacuum biopsy, 8G/7G vacuum excision), the time of NOAC dose, the presence of renal impairment, and whether there are any absolute contraindications to stopping anticoagulation. Haematology advice is recommended in specific situations.
Warfarin/Aspirin/ Clopidogrel: Continuing with existing national guidelines
LMWH preparations: Time of procedure depending on time of last dose.
Conclusion
For Warfarin, Aspirin and Clopidogrel the existing practice continues.
The guidelines on NOACs/ LMWH have now been implemented in our Institution.
We are planning a prospective audit to evaluate the new guidelines effect on our practice.

PB.33

Correlation of number of passes and needle gauge with specimen weight when performing breast vacuum biopsies

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Introduction:
The 2016 NHSBSP guideline recommends 4 grams (g) of tissue is required for vacuum assisted (VA) excision, based on 12 passes with a 7 gauge (G) i.e. 0.33 g/pass. We performed a prospective study to evaluate the weight obtained following 7G and 9G VA procedures.
Method:
We reviewed 127 female patients who underwent ultrasound and MRI VA procedures over a 2 year period where the specimen weights were prospectively obtained. Breast density, BIRADS grading, needle gauge, number of passes and tissue weight were documented.
Results:
Of the 127 vacuum biopsies performed, 104 were with 9G and 23 were with 7G devices. 89 patients had masses and 38 non-mass enhancement. The average number of passes performed on ultrasound was 9.9 and on MRI, 24. Using a 9G needle, the average tissue weight obtained was 3.5g (0.14g/ pass) with a range of 0.64-6g. With 7G needle the average tissue weight was 3.3g (0.6grams per pass) with a range of 1-20g. Breast density did not affect tissue weight. 38 of 127 biopsies found malignancy requiring therapeutic surgery.
Conclusion:
Our results demonstrate that a 7G device exceeded the minimum of 4g tissue with the recommended 12 samples. A 9G device required 29 samples in order to achieve the same weight. However our results show a wide variation of weight obtained and correlation with the exact weight is recommended. Breast density does not have a significant effect on sample weight.

PB.34

Accuracy of first line stereotactic vacuum assisted biopsies in the pre-operative diagnosis of DCIS at Wirral Breast unit. Can we justify the expense and learn from the upgraded cases?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.34

Introduction
The correct pre-operative diagnosis in Breast cancer reduces the number of surgical procedures, patient anxiety, and clinic visits. The percentage of DCIS diagnoses converting to invasion at surgery varies in the literature: VAB 6.1-19.2%. v CB 17-32%. At Wirral, we use VAB as first line for all biopsies we wanted to find out how we compare to other centres, to learn from our upgraded cases and assess whether the cost of VAB offsets the potential cost of second surgery.
Methods
Retrospective review of all pre-operative cases of DCIS and post-operative pathology from 1/1/2015 - 31/12/2016.
Results
10g EnCor needle, average 6.7 cores.
110 cases in total, with 7 exclusions.
85/103 were screening patients.
98/103 biopsies performed for microcalcification.
6/103 cases upgraded post-operatively **(5.8%).**
10/103 cases had 2 VABs at same site to reach diagnosis of DCIS:
7/10 B3,
1/10 B4,
2/10 B2.

Conclusion
Upgrade rate of 5.8% compares favourably.
We costed 100 VABs with an upgrade of 6% against the lowest literature upgrade of 17% for CBs. Costs are roughly neutral; around £20000. However the patient journey is better for more patients when using VAB.
Six upgrade cases reviewed.
Learning points:
2/6 cases insufficient calcium in post biopsy specimen, could have targeted better.
4/6 cases were managed as best possible.
We feel VAB is justified as an accurate first line biopsy technique however we will continue to audit our practice.

PB.35

Papillomas - Impact of the new B3 guidelines on lesion management

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Breast Cancer Research 2017, **19(Suppl 1):**PB.35

Introduction
Recent NHS BSP guidelines for B3 lesions recommend diagnostic excision for papillomas with atypia and large volume biopsy for those without, proceeding to diagnostic excision if further atypia present. Our routine practice is to offer all papillomas second-line LVB 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.
Methods
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.

PB.36

Use of large bore vacuum assisted stereotactic core biopsy (VACB) in breast assessment pre and post installation of full field digital mammography (FFDM) in a UK breast unit

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Breast Cancer Research 2017, **19(Suppl 1):**PB.36

Introduction
In our Trust, FFDM was phased in, replacing analogue, over 11 months from September 2010 to July 2011. We present a retrospective audit of referral practice and pathological outcomes for stereotactic VACBs in our Trust pre and post-FFDM installation.
Method
All patients that underwent stereotactic VACB between January 2004 and August 2010 (pre-FFDM), and between August 2011 and June 2017 (post- complete FFDM installation) were identified from breast unit records. Clinical indication for biopsy, imaging and pathology findings were reviewed, descriptive statistics performed.
Results
Pre-FFDM, 1379 females underwent VACB. Incomplete records excluded 5 patients from imaging analysis, 27 from pathology analysis. Post-FFDM installation 1513 females underwent VACB. Incomplete records excluded 15 patients from imaging analysis, 35 from pathology analysis.
The percentage of patients with a malignant (B5) outcome from VACB of microcalcification was similar before (29% (353/1210)) and after (31% (349/1110)) FFDM installation. However, the proportion of overall VACB workload assessing non-microcalcification is increased in the post-FFDM cohort (pre-FFDM 12% (169/1374) versus 26% (388/1498)). Further analysis suggests this increase pre-dates FFDM (2004-2009 average is 10% (119/1136), versus pre-FFDM 2010 average of 21% (50/238)).
Conclusion
Conversion to FFDM from analogue has not changed the ratio of benign to malignant microcalcification sampled using VACB. An apparent increase in the proportion of VACBs performed for non-microcalcification lesion assessment slightly pre-dates FFDM and is therefore likely to be due to other changes in patient management.

PB.37

Core biopsy of solid breast masses in women aged under 30 years with benign imaging; a 14 year review

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Breast Cancer Research 2017, **19(Suppl 1):**PB.37

Introduction:
In line with medical literature and Association of Breast Surgery guidelines, women aged under 25 years in our Trust do not require pathological confirmation for clinically and ultrasonically benign (U2 and meeting Stavros criteria) solid breast masses.
Core biopsy is invasive and should be avoided where lesions can be confidently classified as benign on imaging.
We retrospectively audited lesion pathology from women aged under 30 years with benign breast examination and ultrasound findings, to see if any malignancies would have been missed if these patients had not had a core biopsy.
Methods:
All women aged under 30 years that underwent breast core biopsy from 2002-2016 were identified from our Trust pathology system. Clinical, ultrasound and pathology findings were reviewed and descriptive statistics performed.
Results:
268 women were identified; age range 14-29 years, including 164 aged 25-29 years. Twenty (20/268) breast cancers were diagnosed, all of which were graded higher than U2. 155 women (155/268) were U2/B2 benign on ultrasound and biopsy.
Three cases were U2 but B3 (n=2) or B4 (n=1) on core biopsy. Imaging review of these three lesions revealed that only one case met current hospital criteria (Stavros) for no biopsy and this proved to be a benign fibroadenoma on surgical excision.
Conclusion:
This 14 year review has demonstrated only benign pathology in Stavros criteria benign lesions in women under 30 years. We propose increasing the age of biopsy for these typical-looking fibroadenomas to 30 years.

PB.38

Ultrasound-guided excision of large fibroadenomas using a large bore vacuum assisted core biopsy device: a single-centre experience in a UK breast unit

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Introduction:
Fibroadenomas do not require excision, however factors such as discomfort or patient choice can lead to their removal. Many fibroadenomas are now removed by minimally invasive vacuum-assisted excision (VAE) under ultrasound guidance, instead of open surgical excision.
Previous studies show that fibroadenomas greater than 20mm in size are associated with two sittings for excision, incomplete excision and increased recurrence rate. Anecdotally, practice varies throughout the UK with many breast radiologists not offering VAE of lesions larger than 20 or 25mm.
We present a retrospective review of our practice and patient outcomes of VAE of large fibroadenomas.
Methods:
All ultrasound-guided VAEs of fibroadenomas ≥30mm performed between February 2010 and June 2017 in our breast unit were identified from department vacuum assisted core biopsy records. Pathology, imaging and patient notes were reviewed, descriptive statistics performed.
Results:
Fourteen large fibroadenomas underwent VAE. Sizes ranged from 30 to 54mm, mean 36.8mm. 6/14 VAEs were performed with 8G needle, 7/14 with 7G and 1/14 with 10G, and 52 to 169 cores were taken (median 81, mean 100.4). All were completely excised in one sitting. 1/14 experienced an immediate small haematoma, 3/14 experienced later bruising and/or mild haematoma; no moderate or severe complications were seen; one fibroadenoma recurred (7%, 1/14).
Conclusion:
Our small series suggests ultrasound-guided excision of fibroadenomas ≥30mm using a large bore vacuum assisted core biopsy device is a safe and effective alternative to open excision.

PB.39

NeoNavia biopsy system: Our experience of a new device for more precise ultrasound-guided percutaneous core biopsy of axillary lymph nodes

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Breast Cancer Research 2017, **19(Suppl 1):**PB.39

Purpose
To present a case series and to describe our experience of using the NeoNavia biopsy device for ultrasound-guided core biopsy of axillary lymph nodes, assessing its acceptability, diagnostic yield and complications.
Method
Retrospective review of lesions targeted for ultrasound-guided core biopsy using the NeoNavia biopsy device. The device incorporates a pneumatic driver that enables a stepwise insertion of the needle under ultrasound guidance with end sampling. Data collected includes; clinician experience, histology results and complications. All biopsies were performed by an experienced consultant breast radiologist.
Results
We present a case series of eight patients with axillary lymph nodes that were successfully biopsied. Of the lesions biopsied, half were considered to be "technically difficult"; prior ultrasound-guided biopsies with a conventional spring-loaded biopsy device had yielded non-diagnostic histology results. The device yielded 100% diagnostic histology results for all lesions. No complications were reported. A post-procedure questionnaire completed by the clinician showed that the biopsy device had increased the clinician's sense of control and technical precision during the biopsy of "technically difficult" lesions.
Conclusion
The NeoNavia biopsy device has shown to be accurate and safe. It increases the clinician's confidence in performing a more precise and safer biopsy of "technically difficult" lesions.
Clinical Relevance
The NeoNavia biopsy device can increase the precision of ultrasound-guided core biopsy of "technically difficult" lesions, including deep axillary lymph nodes. It would also be suitable for ultrasound-guided biopsy of small breast lesions and lesions close to the chest wall.

PB.40

Withdrawn

PB.41

Vacuum assisted biopsy of papillary lesions – our experience

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Introduction
Current NHSBSP guidelines recommend papillary lesions with atypia diagnosed on needle biopsy are surgically excised due to a 36% upgrade rate. Prior to the guidelines, all papillary lesions undergo vacuum excision (VAE).
Method
Retrospective analysis of 125 papillary lesions over a 2 year period.
Results
There were 75% (94/125) papillary lesions with no atypia and 25 % (31/125) with atypia.
Of those with no atypia, 85/94 underwent a VAE and the remainder was discharged. 82% (70/85) were not upgraded by VAE and were also discharged. However 18% (15/85) were upgraded to atypia and 40% (6/15) had surgery where 2 were found to have DCIS and 2 were downgraded to benign pathology.
Of the 31 with papillary lesions and atypia on initial biopsy, 27/31 underwent VAE, 5 were upgraded (2 IDC and 3 DCIS) and 81% (22/27) were not upgraded to malignancy. 9 patients that were not upgraded by VAE had surgery due to pathological suspicion. 6/9 of these surgical results were available, 3/6 demonstrated DCIS at surgery and 3/6 yielded benign results.
Conclusion
Our results show that the papillary lesions with atypia upgraded to malignancy by both surgery or vacuum procedure is 35%, in line with published data. 5 patients with atypia on original biopsy were upgraded by VAB and 6 were upgraded by surgery and a significant majority (82%) was discharged without surgery. Our study indicates a role for vacuum and surgery in the management of papillary lesions.

PB.42

Ultrasound-guided excision of B3 lesions (lesions of uncertain malignant potential) using the hand-held Intact breast lesion excision system (BLES) in a UK breast unit

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Introduction:
The Intact BLES uses radiofrequency (outpatient setting, local anaesthesia) to excise a volume of tissue in one 'intact' piece, as opposed to the fragments obtained using vacuum assisted large bore core biopsy excision (VAE).We present our single centre experience of ultrasound guided handheld excision of B3 lesions using the 20mm Intact BLES.
Methods:
All ultrasound-guided handheld 20mm intact excisions of B3 lesions performed between September 2011 and November 2016 were identified from department records. Pathology, imaging and patient notes were reviewed, descriptive statistics performed.
Results:
Sixteen B3 lesions underwent intact excision, size range 5 to 12mm, mean size 9mm.
11/16 Intact excisions were achieved with one needle pass and were completely excised on imaging and pathology.
In 4/16 a VAE was required to complete the excision, 3/4 at the same sitting, the other returning for VAE at a later date.
1/16 required early follow-up for incomplete excision, not undergoing further intervention.
3/16 patients experienced mild complications: pain/discomfort (2/3), mild bruising (1/3). No major complications were reported.
There are no documented recurrences.
1/16 patients had pathology upgraded by Intact to B5a; the Intact excision was complete and subsequent wide local excision demonstrated no residual disease. No other patient had their pathology upgraded.
Conclusion:
Our small series suggests that ultrasound-guided excision of small B3 lesions using the handheld intact system is a safe and effective alternative to VAE and open excision in selected patients.

PB.43

Recurrence patterns in breast cancer: local versus distant relapse in relation to time-interval and sub-type of breast cancer

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Aim:
The aim of this study was to evaluate the patterns of recurrence of breast cancers in relation to subtypes and elapsed time since original cancer. This would potentially guide follow up imaging.
Methods:
Between June 2006 and December 2016, 202 patients were discussed in Breast Multi-disciplinary team meeting (MDTM) with Computed tomography of chest, abdomen and pelvis (CT CAP). Patients were grouped based on primary breast cancer staging, local recurrence or distant recurrence from a previous breast cancer. Time interval since the primary cancer was stratified in three time frames; 5 or less years, 6- 10 years and more than 10 years (≤5yrs; 6-10 yrs;>10yrs).
Results:
50/202 (24.7%) patients had recurrent cancers. Out of 50 patients, 24 (48%) had local recurrence only, whereas 26 (52%) had distant relapse. 10/26 had local and distant relapse. Within the local recurrence category, majority relapsed less than 5 years from the primary diagnosis (13 patients), followed by more than 10 years (7 patients) with only 4 patients in the 6- 10 years' time interval. In patients with distant relapse, ≤5yrs; 6-10 years;>10yrs was 16:6:4 respectively. Mean time till recurrence was 6.85 years for ER positive cancer versus 3.1 years for Triple negative cancer, which also had the highest percent of recurrence (37.8%).
Conclusion:
Most recurrent cancers (local and distant) present within 5 years, but lesser numbers continue to present in later years. Triple negative cancer present the earliest with highest percent of recurrence compared to other subtypes.

PB.44

Metastatic patterns in locally advanced and recurrent breast cancer: Is there any correlation with molecular subtype of breast cancer?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.44

Purpose
To enhance clinical understanding of different molecular subtypes of breast cancer and their specific patterns of metastasis, which would aid in guiding future imaging surveillance with the objective of detecting metastases and relapses at an early, more treatable, stage.
Method
A retrospective analysis of patients with breast cancer (n=201) between March 2006 and December 2016 was performed. All patients had a staging CT scan of Chest, abdomen and pelvis. Tumours were classified based on Oestrogen (ER) and Human Epidermal receptor (HER2) status. Review of recurrence data, both local and systemic, along with metastasis to site-specific regions, including bone, lung, liver, brain, mediastinum/pleura and extra-axillary lymph nodes, was undertaken.
Result
The most significant associations with distant metastases were between HER2-positivity and the liver (p=0.02), along with ER and HER2 negativity (Triple negative, TN) associated with extra-axillary nodal and mediastinal/pleural metastases (p<0.001). ER-positivity had a strong association with bone metastases, but this was not statistically significant (p=0.44). TN cancers presented most aggressively and had a noticeable correlation with brain metastases (p=0,041). Non-ER-positive cancers had the greatest incidence of systemic recurrence, out of which TN cancers had the highest proportion of metastases (62.2 %). Time till recurrence was smallest for TN tumours (3.1 yrs) versus 6.85 years for ER positive cancers.
Conclusion
The different molecular subtypes have marked differences in patterns of metastatic spread, and risk of recurrence. HER2-positivity is significantly associated with liver metastasis and TN cancers with brain and extraaxillary/mediastinal and pleural metastases.

PB.45

Comparison of outcomes of breast conservation surgery using the Staples method and KliniTray board for orientation of the theatre specimen

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Introduction
During breast conservation surgery radiography of the excised specimen is performed to ensure complete excision of carcinoma with clear margins. There is need for a uniform and secure method of orientation of the excised specimen for the perioperative radiography to enable accurate identification of the 3D margins for the Surgeons, Pathologists and Radiologists, to ensure successful excision of breast carcinoma. We compared the orientation methods using Staples and KliniTray board (new technique commenced in September 2015 in our hospital).
Methods
100 consecutive patients in each group for Staples and KliniTray board. Inclusion criteria are B5a or B5b lesion on core biopsy and lesion localisation with one wire. Comparison of the groups, re-excision surgery rates and amount of resected tissue (specimen and shavings) using each method. Comparison of the costs of each method.
Results
Both groups are similar in average age, numbers of B5a and B5b lesions and median size of lesions. No statistically significant difference in re-excision rates, volumes of excised specimen and cavity shavings. KliniTray board is 9-11 times more expensive than staples per specimen.

Conclusions
No statistically significant difference in repeat surgery or volumes of excised breast tissue using new more expensive method. This is thought due to extra caution of Surgeons using the new technique. But KliniTray board ensures a uniform technique of more standardised way of orientating the specimen for all Breast Multi-Disciplinary Team members involved. The study may be repeated when larger group sizes are available to achieve statistical significance.

PB.46

Barriers and facilitators to large-scale image-based research in mammography

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Introduction
Digital mammograms constitute a rich data source for breast cancer research. Full exploitation requires skills and infrastructure for large-scale image pseudonymisation and management. To investigate the feasibility of a proposed new study, we surveyed 112 Mammo-50 trial sites, to understand capabilities to contribute pseudonymised mammograms using a tool developed for the LORIS trial.
Methods
A Qualtrics online survey, designed to elicit information about technological, human and service capacities to download, pseudonymise and transfer images, was sent to 112 sites. Response format was mostly fixed with some free text. Descriptive statistics were applied.
Results
Overall response rate was 77/112 (69%) but not all respondents answered all questions. Denominators shown are respondents to individual questions. 22/75 (29%) said they could download unanonymised images from PACS to the workstation hard drive; 57% didn't know. 33/65 (51%) said they could access the internet from their PACS workstation; 12% couldn't; 37% didn't know. 24/53 (45%) said they would be able to upload the LORIS tool to their workstation; 9% wouldn't; 45% didn't know. 23/53 (43%) had a staff member to undertake the process; 13% didn't; 43% didn't know. Free-text comments highlighted information governance restrictions and staff shortages, and mentioned the Internet Exchange Portal (IEP) as a potential alternative solution.
Conclusion
The considerable challenges for local sites in contributing to large-scale imaging research demonstrate the need for processes which minimise local workload. The next step is to investigate IEP's suitability for research image collections.

PB.47

Comparison of diagnostic accuracy and pre-operative tumour size assessment between contrast enhanced spectral mammography (CESM) and breast MRI

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Aim:
The purpose of this study is to compare the diagnostic accuracy of tumour detection between CESM and MRI. Preoperative tumour size assessment using CESM and MRI were also correlated with the final postoperative histological size.
Methods:
A retrospective review was performed of 87 patients who underwent CESM with 92 biopsied lesions. 28 patients also underwent an MRI examination. Dimensions of lesions measured with each modality were compared to post-operative histopathology results. Diagnostic accuracy parameters were also calculated between the two modalities.
Results:
Of the 92 biopsied lesions, 87 were malignant on histology. The sensitivity of cancer detection was 98% for CESM, compared to 100% for MRI. The specificity was 80% for CESM, compared to 50% for MRI. The positive predictive value of cancer detection was 98% for both CESM and MRI. The negative predictive value was 73% for CESM, compared to 100% for MRI.
In regards to size assessment, the mean size difference between CESM and histopathology was 0.7 mm. The mean difference between breast MRI and histopathology was 4.2 mm.
Conclusion:
In our study, CESM appeared to have a higher specificity and lower sensitivity in cancer detection when compared to breast MRI. Tumour sizing with CESM was also more accurate than with MRI, with a lower tendency for overestimation when compared to final surgical histology. However, the reduced sensitivity of CESM has highlighted a few false negative cases. Further larger studies are required to assess the added value of CESM over breast MRI in preoperative tumour assessment.

PB.48

Staying abreast of the situation: diagnosis and referral pathway for CT detected breast lesions

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Continual advances in multidetector CT and increased awareness of breast pathology has led to a rise in the number of incidentally detected breast lesions reported on general CT. This often poses a challenge to the general radiologist, and these patients frequently get fast-tracked to one-stop breast clinics. This increases patient anxiety and generates added workload for an already stretched national breast workforce. Breast lesions can often be sufficiently characterised on contrast-enhanced CT into benign, intermediate and suspicious categories.
Referrals made to St. Helen's Breast unit for CT detected breast lesions over a two-year interval were retrospectively reviewed. The lesions were reassessed to see if/how the lesion was characterised in the report and whether any defining benign or malignant features were present. Outcomes of these referrals were also reviewed to assess if the patient underwent unnecessary investigations and/or interventions.
Most incidentally detected breast lesions (89%) were found to be benign, which was supported by chronicity, morphology and lack of enhancement. However, the study proved that malignant lesions can also be detected and characterised, particularly in contrast-enhanced examinations, with enhancement >50 HU and irregular shape being the most predictive indicators of breast malignancy. Based on the results, a pathway has been designed to aid in the interpretation of such lesions and to streamline an appropriate referral process for indeterminate and suspicious lesions.
The breast is an important review area on CT, and this pathway is a useful tool for its evaluation.

PB.49

Accelerated partial breast irradiation: review of 10-year experience in an Irish cohort including procedure, outcomes and radiological features of recurrence

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Introduction
Accelerated partial breast irradiation (APBI) is a targeted short course of therapy that is an alternative adjuvant option to whole breast irradiation (WBI) in selected patients after breast conserving surgery (BCS). We aim to describe the technique, determine criteria for performing it and demonstrate the radiological features and risk factors for recurrence.
Methods
79 patients underwent APBI from January 2006 to September 2016. Patients post BCS with favourable prognostic parameters were selected following MDT discussion. All patients underwent wide local excision (WLE) with sentinel lymph node (SLN) sampling prior to treatment with APBI. Average tumour size was 14.65mm. Following catheter insertion under GA and treatment planning with CT, high-activity radioactive source (Iridium-192) was introduced into each treatment catheter using a high dose rate after-loading microselectron. Review of individual patient records was performed to determine outcome and recurrence.
Results
No patient had significant procedure-related complications and all completed treatment within the timeframe of five days. Two patients had local recurrence in the original clinical target volume (CTV). One had recurrence in the ipsilateral breast outside the CTV; one developed a new contralateral breast cancer. The overall survival (OS) rate was 97% (median follow-up of 65 months). The rate of distant metastasis was 1.3%.
Conclusion
APBI is a promising treatment option for patients with early breast cancer, with shorter duration of treatment. Outcomes are comparable to those with conventional WBI. APBI is a suitable alternative radiation treatment for patients with small tumours with favourable prognostic features.

PB.50

An evaluation of radiation dose and imaging costs in patients undergoing neoadjuvant chemotherapy compared with patients undergoing adjuvant chemotherapy for breast cancer at a regional cancer centre in Ireland

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Background:
Radiological investigations are required for both the diagnosis and staging of breast cancer. Further imaging is often required both in treatment planning to assess response to treatment and to clarify indeterminate findings. The aim of this study is to assess if there is a difference in radiological dose burden experienced by those patients undergoing neoadjuvant chemotherapy (NAC) compared with those undergoing adjuvant therapy.
Method:
A retrospective review of a prospectively maintained database from 2010-2015 was undertaken to establish the total number of radiological investigations in the first year of diagnosis for patients receiving chemotherapy.
Data collected includes; demographic, histopathology, radiation exposure and imaging costs.
Results:
Five hundred and thirty eight patients underwent chemotherapy; 199 in neoadjuvant and 399 in the adjuvant setting. Patients receiving NAC underwent more radiological investigations with significantly more CT scans (mean 4.1 vs 2.1, $p<0.001$), PET/CT (mean 0.1 vs 0.003, $p=0.003$), and NM Bone scans (mean 1.2 vs 0.8, $p<0.001$) being performed. This resulted in higher radiation dose exposure. More MRI investigations (mean 1.8 vs 0.9, $p<0.001$) were also performed in patients receiving NAC, resulting higher financial costs for this patient group.
Conclusions:
Consideration should be given to reducing the radiation dose exposure of imaging in breast cancer, particularly in patients receiving NAC. Standardised staging and restaging protocols could both reduce dose burden and financial costs for the healthcare institution treating these patients.

PB.51

18F-NaF PET CT in staging of breast cancer: three years' experience in a regional cancer centre

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Introduction:
18F-NaF PET-CT in breast cancer patients has an evolving role in the diagnosis of bone metastases. It can serve as a key diagnostic tool when baseline imaging is equivocal.
In staging, patients often have multiple imaging modalities performed, adding to patient stress and the economic impact of their treatment.
Over a 3 year period, 35 18F-NaF PET-CTs were performed for 33 (32 female 1 male) patients with equivocal lesions, or lesions of clinical concern on NM Bone scan, MRI or CT, discussed at multidisciplinary breast cancer meetings.
30 patients had scintigraphy prior to imaging; on average 3.6 months prior to PETCT.
12 (34 %) patients had an area of concern on scintigraphy and 3 patients had a metastatic deposit on scintigraphy.
Results:
Of the 33 patients; 19 had ductal carcinoma (IDC), 8 had lobular carcinoma (ILC), 2 were mixed and 4 unknown.
The ILC subgroup (N=8); 5 had concerning scintigraphy and 4 had confirmed metastases on NaF. Of this subgroup 2 had node positive disease.
Within the IDC subgroup (N=19); 7 had lesions of concern on scintigraphy and one had known metastases. 4 had confirmed metastases within this subgroup on NaF PET CT and 1 lesion requiring further follow up.
Discussion:
In a multidisciplinary setting, selective NaF PET CT is a useful tool, in providing reassurance when negative and also in detecting additional metastatic disease, particularly in ILC where baseline imaging is equivocal. This has a significant impact on future treatment planning.

PB.52

CT detected breast lesions: imaging features and pathway for appropriate referral to the symptomatic service

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Introduction
Increasing use of CT has led to the increasing detection of incidental breast lesions. Our pathway of referral for these lesions aims to filter out benign lesions, minimising the strain it imposes on the symptomatic services. We evaluated the effectiveness of this pathway by determining the percentage of referrals which proved malignant. We also described the morphology and attenuation values of lesions.
Method
On detecting a breast lesion on CT, radiologists at North Tees hospital, Stockton, and James Cook Hospital, Middlesbrough, email the Teeswide breast radiologists. We then review our breast PACS to see if the patient has previous screening or symptomatic mammograms/ ultrasound. If the lesion is new or there is no previous imaging, we

advise referral to a breast clinic. If the lesion is longstanding, unchanged or definitely benign, we advise no further action. We prospectively reviewed the morphology, attenuation values, ultrasound and mammogram features and biopsy results of 22 breast clinic referrals generated in this way.

Findings

Attenuation values of lesions varied from 4 Hounsfield units (HU) to 107HU, averaging at 51HU. 16/22 lesions were malignant, 2 benign and 2 normal breast tissue. 2 patients died before attending clinic. Malignant lesions were ill-defined and irregular on CT.

Conclusion

73% of referrals generated by our pathway were malignant proving its effectiveness. Another 9% referred were radiologically likely to be malignant, but died before attending clinic. Attenuation values of lesions were very variable; being dependent on the phase of CT. Malignant lesions were ill-defined and irregular.

PB.53

Incidental breast lesions detected on CT – findings and outcomes

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Breast Cancer Research 2017, **19(Suppl 1):**PB.53

Purpose

Incidental lesions within the breast are increasingly being reported on CT with subsequent referral to specialist breast services for dedicated breast imaging. The aim of this study is to investigate the nature of the CT finding detected, the outcome of breast lesions detected incidentally on CT following breast imaging +/- biopsy and to try to identify CT features suggestive of malignancy.

Materials and Methods

A retrospective review of patients referred with incidental findings on CT was performed over a 6 month period. 72 patients were identified. CT lesion morphology, enhancement, subsequent breast imaging and final outcomes were assessed.

Results

72 female patients were identified. 24% of patients underwent further investigation with mammography alone, 76% with mammography and ultrasound. All patients were assigned an RCR score. 34% underwent biopsy. 85% of lesions referred for further investigation from CT represented benign findings and 15% were malignant lesions. All 11 malignant lesions were masses. 10 of 11 malignant masses demonstrated enhancement on CT. The malignant mass which did not demonstrate enhancement was detected on CT Pulmonary Angiogram. Three other lesions demonstrated enhancement but represented a benign lesion on biopsy.

Conclusions

Incidental breast lesions are increasingly being referred to breast services for further investigation. Of those referred the majority demonstrate benign findings. Malignant lesions are typically masses which demonstrate enhancement.

PB.54

A review of staging investigations for inflammatory breast cancer in a district general hospital

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Breast Cancer Research 2017, **19(Suppl 1):**PB.54

Introduction

Inflammatory breast cancer is rare and aggressive with a poor prognosis. This review details the staging investigations performed and outcomes for these patients.

Methods

Electronic records of all inflammatory breast cancer cases diagnosed in NHSL from 1st January 2010 to 31st December 2016 were analysed to identify staging outcomes.

Results

30 patients had pathological confirmation of inflammatory breast cancer of whom 27(90%) had staging (1 pregnant, 1 declined and 1 with known metastases). 4/27(15%) had metastatic disease at presentation on CT. 16 had a negative CT, 12 remain disease free and 4 developed metastases (range 23-41 months). 7 patients had indeterminate lung nodules/liver lesions. Of these 6(86%) developed metastases (range 3-16 months). 13/30(43%) patients remain disease free (mean f/up 38 months). 4/30(13%) are alive with metastatic disease. 7/27(26%) developed brain metastases (4 within 6 months of diagnosis). 2 patients (7.4%) had a positive bone scan(both cases metastases were visible on CT scan). 3 patients (12%) with negative bone scans subsequently developed bony metastases (range 14-41 months).

Conclusions

85% of patients with indeterminate lesions subsequently developed metastatic disease within 16 months. More accurate staging of these patients e.g. PET-CT may spare them unnecessary treatment. The relatively short time periods in which this patient group developed cerebral metastases suggests that there may be a role for CT head in initial staging investigations. Results also provide evidence that routine isotope bone scanning is not beneficial.

PB.55

Is isotope bone scan of added benefit to CT thorax/abdomen/pelvis in detecting skeletal metastases in breast cancer staging?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.55

Purpose

The NCCP guidelines state that in patients undergoing staging for newly diagnosed breast cancer contrast enhanced CTTAP and whole body isotope scan are recommended. Detection of metastases has a major effect upon patient management and prognosis. Conversely, unjustified imaging can increase radiation exposure, hospital workload, patient anxiety and is not cost effective for the health authorities.

Aims and Methods

A retrospective review of patients diagnosed with Stage 3+ breast cancer between 2011 and 2015 was undertaken in a large tertiary care cancer hospital in Dublin. We aimed to determine the frequency and relevance of positive findings. We looked specifically at isotope bone scans to evaluate whether their requirement in national guidelines was justified. We looked at metastases detected on CTTAP versus those detected on bone scan and examined the incremental benefit of bone scan in addition to CT. Furthermore we looked at false positive bone scans and the related cost and patient implications.

Results

460 patients were identified that underwent isotope bone scan and CTTAP out of a total cohort of 1469. CTTAP was positive for metastases in 63(13.7%). Isotope bone scan was positive in 49(10.6%) which included 40(8.7%) of which were positive due to bone metastases. 9/460 (2%) patients were diagnosed with metastases not seen on CT. 3 patients had bone metastases that were not seen on CT despite evidence of visceral metastases. 9 patients had false positive bone scans requiring 5 MRI's, 2 X-rays, 1 CT and 9 additional consultations.

PB.56

The male breast: an audit of imaging and referral practice before and after introduction of new departmental imaging guidelines

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Breast Cancer Research 2017, **19(Suppl 1):**PB.56

Introduction
Following literature review and retrospective audit within our Trust, local guidelines were introduced in October 2015; clinically suspected gynaecomastia (P1, P2) would no longer undergo routine imaging. We retrospectively audited referral practice for male breast imaging pre- and post guideline implementation.
Methods
All men referred to breast clinic from October 2014 to November 2016 (26 months) were identified from electronic records. Clinical, imaging and pathology findings were reviewed.
Results
Pre guidelines (October 2014-October 2015), 118 men attended breast clinic scored clinically as: P1 (n2), P2 (n99), P2/3(n1), P3(n2), P3/4(n1), P4(n1), P5(n3), no P score (n9). All P1 and P2 imaging findings were benign; 3 were biopsied, all yielding benign histology.
Post guidelines (November 2015-November 2016), 164 men attended clinic, scored as: P1 (n13), P1/2 (n2), P2 (n52), P2/3 (n39), P3 (n53), P4 (n3), P5 (n0); two were excluded (referrals post-CT imaging). All imaged P1, P2, P2/3 patients had benign appearances; none underwent biopsy. All P3s were U1 or U2 except four U3s; seven P3s underwent biopsy yielding one malignancy.
Following guideline implementation, referrals for male breast imaging decreased from 72% (85/118) to 59% (95/162), but the proportion assigned clinical scores >P2 (in those imaged) increased from 9% (8/85) to 91% (86/95).
Conclusion
Imaging and any subsequent biopsy supports all P1 and P2 clinical findings. Guideline introduction has reduced imaging over investigation, but many more men are being assigned clinical scores >P2.

PB.57

Investigating breast symptoms in 16-24 year olds. How & why?

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Breast Cancer Research 2017, **19(Suppl 1):**PB.57

Abstract
Poor resources in breast imaging across the country have prompted us to think about how we investigate younger patients. The incidence of breast cancer in women and men under the age of 24 is very low (1.5 per 100000 in the UK 2012-4), yet assessing this cohort can prove a significant imaging burden and contribute to patient anxiety. We have therefore reviewed the practice regarding 16-24 years at two large centres on the south coast over the last four years. Our hope is to be able to create better guidance on how best to investigate these patients in the future. The review included clinical, imaging and histopathology findings. Our review showed approximately 4000 Breast Ultrasounds were carried out in over 3000 patients, with 251 breast biopsies being performed. Of these biopsies, only 10 had histology of B3 or above, with just two proving malignant. Our data suggest clinical suspicion, known high family risk, and behavior of the breast mass are better predictors of malignancy than imaging.

Learning objectives:

- Is tissue sampling valuable in this age group?
- Are features in the presentation better predictors of diagnosis than imaging?
- What are the key imaging features to look for?
- When is pre-operative tissue sampling valuable?
- How can we best use our limited workforce and other resources?

PB.58

Phyllodes tumours: review of imaging characteristics of benign, borderline and malignant tumours over a 10-year period

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Breast Cancer Research 2017, **19(Suppl 1):**PB.58

Introduction
Phyllodes tumours are rare fibroepithelial lesions, accounting for 0.3 – 0.5% of breast tumours. They are subdivided into benign, borderline and malignant lesions based on specific pathological features. As malignant lesions have the propensity to rapidly grow and metastasize it is important to identify these lesions and treat them appropriately. The aim of this study was to review all Phyllodes tumours identified at our institution over a 10-year period, to determine the imaging features of benign, borderline and malignant Phyllodes tumours.
Methods
A prospectively maintained database was interrogated to identify cases of Phyllodes tumours from January 2008 to June 2017. Basic demographic features were recorded and cases were reviewed to determine the imaging features, including size, US, mammographic and MRI features. Histology and individual follow-up of cases were also reviewed to determine outcomes. Results A total of 50 patients were identified with Phyllodes tumours over the 10-year period, 10 malignant, 5 borderline and 35 benign. The average size of the malignant lesions was 8.2cm, 4.2 cm for borderline and 2.8 cm for benign lesions. 70% of the malignant lesions were markedly hypoechoic and 60% had a heterogeneous echogenicity on US, 17% of the benign and borderline tumours were markedly hypoechoic and 30% had a heterogeneous echogenicity. One malignant and one benign Phyllodes developed recurrence.
Conclusion
In this series, 20% of Phyllodes tumours were malignant, being larger than the benign and borderline lesions and more likely to be markedly hypoechoic and have a heterogeneous echotexture on US.