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Abstract Book

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Breast Cancer Recurrence following treatment – Imaging Features

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Introduction: Breast cancer recurrence (BCR) presents in many ways, often taking many years to develop following the primary breast cancer. Annual mammographic surveillance, and in some centres, annual clinical surveillance, aims to detect locoregional recurrence however, distant metastasis are identified on a variety of modalities. This study aims to identify imaging features of breast cancer recurrence on mammography and cross-sectional imaging and to elucidate time periods which might confer risk in certain patients.

Method: All cases of BCR in a single centre from 2011 to 2016 were evaluated. Patients who underwent restaging CT were identified. Imaging was retrospectively reviewed on PACS to determine the site and nature of recurrence. The imaging features of locoregional recurrences will be documented. Histology of initial diagnosis and recurrence will be reviewed to ensure true recurrence.

Results: 94 patients with a first BCR during the study period were identified. 45 (47.9%) recurrences were identified clinically and 42 (44.6%) radiologically. Clinical data was incomplete in 7 patients. Radiological modalities that identified recurrence included mammography, ultrasound, CT, magnetic resonance imaging and bone scan. On mammography, recurrences included mass, microcalcifications, asymmetry and architectural distortion. Mean time to recurrence was 6.6 years (range 0.9-29 years). 17 (18.1%) patients had evidence of distant metastasis at the time first recurrence was identified.

Discussion: The present study highlights the imaging features of BCR, an important topic as radiologists review surveillance mammography annually. In this cohort, biopsy proven recurrence was identified in patients at up to 29 years post initial diagnosis.

Feasibility of Polyvinyl Chloride's as a breast ultrasound phantom

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Phantoms provide a controlled environment in which to test the performance of imaging modalities and to develop new methods. They can also be used to simulate different tissue types, allowing for more accurate testing. A standard biological breast soft tissue has a speed of sound of 1450 to 1540 (m/s) and an attenuation coefficient of 0.3 to 0.7 (dB/cm/MHz), while breast glandular tissue has a speed of sound 1430 to 1630 (m/s) and attenuation of 0.5 to 1.0 (dB/cm/MHz)[1,2].

Various samples of PVC material were fabricated, each of which contains a different concentration of PVC and an additive. The process is split into two stages: lesion fabrication and background fabrication. In the lesion fabrication stage, the lesion is created with 8 x10^2, to simulate isoechoic pattern with 0% GP, hypoechoic pattern with 0.1% GP, and hyperechoic pattern with 2% and 4%. Whereas, to simulate the background, it was mimicked using 8 x10^2with 0.5% GP. The silicone mould is used to shape the lesions.

Breast tissue samples was tested based on speed of sound, attenuation, acoustic impedance. Sample with 0.1% GP mimics breast glandular tissues with speed of sound of 1454 (m/s) and attenuation of 0.45 (dB/cm/MHz), while sample with 0.5% mimics breast fatty tissues with speed of sound of 1502 (m/s) and attenuation of 0.64 (dB/cm/MHz). However, samples with 2 and 4% GP mimic various types of breast lesions, with sound speed of 1578.11 and 1645.76 (m/s) and attenuation of 1.21 and 1.76 (dB/cm/MHz), respectively.

The Good, The Bad and the Ugly; A Glossary of Breast Calcifications.

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Introduction: Breast calcifications are common mammographic findings which can be benign or malignant. 1 They can arise from the terminal ducts (intraductal calcifications) or within the acini (lobular calcifications). 2,3 The diagnostic approach to breast calcification involves analysis of morphology, distribution, and interval change. 2-6 This glossary aims to categorize commonly used terms with representative imaging in the assessment of breast calcifications.

Results: The BI-RADS lexicon outlines morphologic and distribution descriptors of breast calcification into the following designated categories that predict benignity or malignancy: 2

Morphology:
- Typically benign (BIRADS 2) – This constitutes skin, vascular, coarse/popcorn, punctate, eggshell, dystrophic, milk of calcium and suture calcification. No imaging follow-up required.
- Intermediate concern/suspicious (BIRADS 3/4): Amorphous or coarse heterogenous microcalcifcation. These are indeterminate and therefore biopsy is recommended to determine the exact aetiology.
- High probability of malignancy (BIRADS 5): Fine pleomorphic or linear branching subtype of microcalcifcation, where urgent biopsy is recommended.

Distribution:
- Typically benign (BIRADS 2) – Diffuse, scattered or regional (>2cm) microcalcifcation. No imaging follow-up required.
- Intermediate concern (BIRADS 3/4) – Grouped (<2cm) or clustered microcalcifcation are indeterminate and therefore biopsy is required to determine exact aetiology.
- High probability of malignancy (BIRADS 5) – Linear or segmental distribution are highly suspicious for malignancy where urgent biopsy is recommended.

Discussion: Assessment of breast calcification poses a diagnostic challenge. The BIRADS lexicon can aid in the risk stratification of breast malignancy. This poster aims to act a visual tool to help in this assessment.

Short term recall Audit in the Bedfordshire and Hertfordshire Breast Screening Unit

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Introduction: Short term recall is used when a definitive diagnosis cannot be reached on the initial attendance. This should only be used in exceptional circumstances, with informed patient consent and agreement in MDT. As per the NHS Breast screening programme standards(1) and Clinical Guidelines for breast cancer screening assessment (2), the performance thresholds are acceptable (<0.25%) and achievable (< 0.12%). Bedfordshire and Hertfordshire Breast Screening Unit serves a large population and it is essential to audit our service.

Method: Women who had a short term recall assessment between April 2020 - March 2022 were selected. Data was acquired from NBSS, Sectra PACS and patient folders with retrospective analysis performed.

Results: There were 113,683 women screened and 93 women who had a short term recall. The largest proportion offered short term recall were due to B1 biopsy results or target not being identified.
At short term recall assessment, 86 were downgraded to R1/R2 on imaging and 7 women had a biopsy or vacuum assisted biopsy (VAB), of which 2 cancers detected. Performance threshold: 0.082%.

Discussion: On review of these two patients with cancer detected, one patient withdrew consent and short term recall was appropriately used. For the other patient with a B2 histology, our centre now performs VAB for discrepant histology rather than a short term recall. Therefore, short term recalls should reduce with reduced cancer detection on the recall assessment. Our performance threshold is below the achievable level and current practice will be re-audited in 2 years.

Role of CT restaging in locoregional breast cancer recurrence – Does it add benefit?

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Introduction: In the setting of locoregional breast cancer recurrence (BCR) the National Comprehensive Cancer Network currently advises restaging with CT to assess for metastatic disease in the thorax, abdomen or pelvis[1]. Approximately one-third of these patients will have radiological evidence of metastasis. Despite this low yield, evaluation with CT in cases of BCR is commonly performed. This study aims to determine the number of patients with BCR who undergo CT, the imaging outcomes and the need for additional imaging and follow-up.

Methods: All cases of BCR in one centre over a five-year period (2011-2016) were identified from a prospectively maintained database. The institutional picture archiving and communication system was searched to retrospectively identify patients who underwent restaging CT. The identification of distant metastasis and incidental findings requiring further workup was noted.

Results: 94 patients with a first BCR during the study period were identified. Patients who presented with distant metastasis (n=3) were excluded and 7 had incomplete data. Of the remaining 84, 45 (49.4%) were identified clinically and 39 (42.8%) radiologically. 65 (77.4%) patients underwent restaging CT with distant metastasis identified in 13 (15%).

Discussion: The role of restaging CT in patients with locoregional BCR remains unclear. As demonstrated in this cohort, it's use is commonplace with 77.4% of patients with BCR having undergone CT restaging. However, the yield is low with distant metastasis identified in only 15% of patients. Rationalisation of the approach to restaging BCR has the potential to reduce individual radiation exposure, equity of resources and cost.

Axillary Ultrasound assessment in patients with newly diagnosed breast cancer

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Introduction: Recent evidence indicates that Axillary lymph node dissection (ALND) is no longer mandatory for selected early node positive breast cancer patients.
Accurate pre-operative axillary ultrasound and guided biopsy is key to quantification of axillary disease into groups of low disease burden (1–2 nodes) and higher disease burden (≥3 nodes). It is only this second set of patients, with ≥3 positive nodes, which truly requires ALND.

Methods: Assessment of compliance with reporting guidelines.
The Standard:
- Number of suspicious nodes - < 3 or ≥ 3.
- Maximum cortical thickness of largest node (≥ 3 mm)

Indicators :
- % of ultrasounds mentioning number of suspicious axillary nodes.
- % of ultrasounds giving the maximum cortical thickness of largest node.
- % of US scans in which the abnormal node was biopsied.

Results: Cohort of 30 patients between 01-12-2022 and 01-12-2023.
- Number of abnormal nodes mentioned in all reports.
- In 22/30 cases, defined as <3 (1 or 2) or ≥3.
- In 6/30 cases - "a" suspicious node reported.
- In 2/30 cases - "several nodes" reported.
- Maximum cortical thickness of largest node: Mentioned – 14/30, < 3 mm - 2/30, ≥ 3 mm - 12/30, not mentioned - 16/30.
- 100% of abnormal nodes (30/30) were biopsied.

Discussion: The data was presented to the Breast team and the reasons for poor reporting discussed, including: multiple radiologists, different reporting styles, lack of time. The importance of accurate reporting of the axilla in breast cancer patients was elaborated. It was decided to re-audit in 6 months' time.

Oncoplastics are fantastic: A radiologist's guide to pre and post operative imaging.

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Introduction: In recent years there's been a shift towards oncoplastic surgery with an accompanying increase in surgical options for breast cancer treatment[1], [2]. Radiology input at MDT helps to guide surgical planning. Additionally, radiologists must be familiar with post-operative radiological appearances, which can present a challenge[3].

We give an overview of the radiological information required to guide surgical planning, different types of oncoplastic surgery, their indications and post-operative appearances.

Findings: Surgical method depends on several factors including: cancer site and extent; multifocal or multicentric disease; involvement of the nipple, skin or pectoral muscles; breast size and shape; patient risk; patient preference and need for post-operative radiotherapy.

Preoperative localisation of non-palpable cancers is essential to minimise loss of breast tissue and improve surgical outcomes[4]. Method of localisation is decided on a case-by-case basis.
Types of oncoplastic surgery can be broadly divided into breast conserving surgery (BCS) or mastectomy. There are 4 main types of BCS: simple wide local excision, therapeutic mammoplasty or mastopexy (tissue rearrangement procedures) and tissue replacement procedures (chest wall perforator flap surgery)[1]. Following mastectomy there are options for breast reconstruction (immediate or delayed). Some techniques require additional preoperative information such as CT angiogram for arterial anatomy.

Normal post-operative mammographic appearances include scarring, fat necrosis and calcification.

Discussion: Knowledge of the different oncoplastic surgical techniques is useful for the radiologist and may help guide reporting to ensure that relevant information is highlighted. Familiarity with the post-operative appearance of these procedures is essential for interpretation of future surveillance mammograms.

AI-driven personalised mammography education

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Purpose: To develop artificial intelligence (AI) engines for personalising mammographic test-sets. We looked at three situations:

- Existing users engaging with test-sets
- New users
- New test-sets

Methods: The first situation required matrix factorisation to build a model to predict the rating provided by existing reader on cases they had not previously seen. 479 clinicians were involved and AUC for predicting the difficult-to-interpret cases for each reader was found. The second situation focused on new users who had not engaged with test-sets. 905 individuals completed a questionnaire, ensemble trees were created and Pearson correlation values between predicted values by the model and actual values were calculated. Finally, the work on new test-sets relied on global and local radiomic features to estimate difficulty with 480 mammographic examinations, eventually read by between 46 to 352 radiologists and the AUC was calculated for ability to predict easy-to-interpret from difficult-to-interpret cases.

Results: The model for predicting difficult from easy cases for existing users showed a reached an AUC of 0.81 (95% CI: 0.74-0.88). For new users the Pearson correlation coefficient between the predicted AUC and actual AUC was 0.60 ($p < 0.001$), whilst the AUC to indicate its ability to differentiate between first and fourth quartile

readers was 0.86 (95% CI 0.83–0.89). The mean AUCs produced by the third model for predicting difficult-to-interpret cancer and normal cases for new material were 0.87±0.21 and 0.70±0.29, respectively.

Conclusions: Our novel AI-solutions appear to be able to customise test-sets for individuals.

Hidden Dimensions: Evaluating Breast Cancer In Women With Implants

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Introduction: Whilst some breast cancers remain mammographically occult, this proportion increases in women with implants which compress and distort breast tissues. We present a series of such tumours and recommend optimised imaging strategies

Method: We retrospectively reviewed a prospectively collected local series of newly diagnosed cancers in women with existing breast implants, analysing any presenting symptoms, mammographic visibility, site, size and lesion appearance, ultrasound images and MRI (if performed) alongside the final surgical histological findings.

Results: 35 cancers collected between 2009 and 2024, age range 35 - 80y (mean 51y). >70% cases were left sided. 12 were screen detected, two were mammo occult with symptoms.

Of 23* remaining symptomatic cases, eleven were mammo occult despite six being palpable, another visible on single view. Overall, 40% tumours were mammographically occult; although one measured 108mm on MRI. A further 14 women had preoperative MRI. The mammographic size 0 - 79mm, sonographic 0 – 59mm; Pearson correlation coefficient of 0.48 indicates consistent underestimation of mammographic tumour size.
5 were sonographically multifocal, yet mammographically unifocal.

Discussion: We highlight the challenges of cancer detection in implanted breasts, suggesting MRI be included as standard preoperative work up, to improve diagnostic accuracy and optimise treatment planning.

MRI could be recommended as a potential enhanced screening tool for these women as large numbers of their cancers remain mammographically occult. Plus, because the number of women undergoing breast augmentation rises annually worldwide and breast cancer risk increases with age, this will remain a significant radiological and oncological issue.

Contrast enhanced mammography; comparison with MRI in a Double-Blinded study; Strengths and Weaknesses of CEM to MRI.

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Introduction: Contrast-enhanced mammography(CEM)is an emerging modality with potential of reducing the number of MRIs required for preoperative staging for breast cancer to reduce waiting list for staging breast. CEM is easily accessible.

Aims: Double blinded study-3Consultant-Radiologists reported CEMs independently and registered their findings. CEM results were compared to MRI-findings as the gold-standard in staging breast cancer.

Method: CEM started in our department inJuly2023.We are assessing the1st 42patients.CEM was requested at MDT for all patients who need further MRI-staging.
2readers would read each CEM independently blinded to MRI findings. Findings were uploaded on Excel and CEM results were checked for agreement and compared to MRI findings, results of 2ndlook Ultrasound+/- biopsies and final surgical outcome.

Results: 42patients were assessed. Indications for MRI were: 20 dense breast,8lobular cancers,2occult on mammo,11multifocal and 1 patient with DCIS. CEM showed multifocal disease in presumed unifocal diseasein12patients at standard imaging. Multifocal disease show excellent visibly with good glandular suppression in /42;mild background glandular enhancement(BGE),mod in 11/42 and 2showed marked. Readers agreed in26/42 CEMs. Disagreement was on number of lesions, size of NME was more subjective and 2 patients had a contralateral focal mass not noticed by other reader(1-false +ve)and a haematoma was interpreted as an

enhancing mass. MRI vs CEM reports; Lesion appeared smaller on MRI in 3/42 pts, NME was more visible and sized bigger on MRI in4/42.3 more.

Conclusion: CEMi novel procedure. Readers agreed with MRI results in 71%of cases,30/42, with minor differences not significantly change in outcome as detailed. MRI appeared as good as CEM but showed limitations in disease closer to chest wall and axillary disease. Therefore, CEM can significantly reduce pressures on MRI, increase capacity and reduce time to diagnosis.

Contrast Enhanced Mammography -A Problem Solving Tool When No Current Procedure helped

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Purpose: Contrast-enhanced mammography(CEM)has emerged as a viable alternative to breast MRI.MRI remains the gold-standard of imaging dense breast an occult disease. There are occasions when MRI and standard imaging are either not feasible or accessible.

Aim: Share and explore options where CEM provided a better diagnostic outcome with CEM.

Methods: CEM can be used as an alternative to MRI especially if MRI is not an option for the patient. But we are discussing the situations when standard practice of MRI, mammogram and ultrasound had their limitations where CEM came to the rescue.

Results: CEM acts as alternative-in: Pacemaker;(or devises incompatible with MRI) patients who have a pacemaker are contraindicated to MRI.

Claustrophobic patients. Patients refusing 2ndMRI for post Neoadjuvant treatment response (NAC).So instead had CEM for assessment response with accurate outcome.

SecondLook-US; After MRI staging occasionally patients with multifocal diseas, require 2ndlook US. Identifying occult disease on standard Mammo/US, can be difficult as patient are in a different position. CEM was helpful increasing confidence of success of targeting the lesions and cross-referencing post clip mammos with MRI.

Magnetic markers; create an artefact on MRI. CEM was more reliable in assessment for additional disease or for NAC response.

Alternative of MRI Biopsy: Additional lesions on MRI not found on 2nd look US; Our standard practice is to proceed with difficult study of MRI-guided biopsy. Lesions were identified on CEM and cross-referenced for Stereo/Tomo-guided biopsy, Although, the future holds CEM-Guided Biopsy will potentially replace MRI biopsy and possibly even 2nd-lookUS with more accurate targeted one-step procedures.

Conclusions: CEM-has potential for use in many situations, particularity when standard imaging has limitations. CEM can be a problem-solving tool to improve diagnostic accuracy and confidence of diagnosis.

Contrast enhanced Mammography; Artifacts, Contrast Concentration and Challenges Affecting Image quality is our first 50 patients.

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Purpose: Contrast-enhanced mammography (CEM) has emerged as a viable alternative to contrast-enhanced breast MRI. As it a new modality there are challenges to our radiographers to produce the best possible image for diagnostic purposes.

In this study we will present various factors that may have influenced the quality of our1st 50 CEM cases scanned Newcastle hospitals.

Methods: 2 consultant radiologists and two experienced radiographers reviewed the 1st50CEMs assessing how various techniques, contrast dose, delayed scans influence the images.

We looked at the various artifacts produced and techniques of avoiding them.

We compared the1st15 patient; 1. Compared-100mlofOmnipaque to the quality of image and conspicuity of lesions when we started following the recommended a1.5 ml/kg as per manufacturer's recommendations.2. Artefacts and how that influenced the results of images.3.We have performed delayed scans of symptomatic side of all patients and conspicuity of lesions was compared on the early compared to the later phases.

Results: CEM technique- We started by injecting the standard dose of 100 mg at 3 mL/sOmnipaque then after 15patients we decided to move on to injecting does of1.5mg/kg of the patient's weight.

Lesion conspicuity is better; from mild/moderate visibility to high visibility on the delayed scans which is usually6-10 minutes-depending on type of cancer-following contrast injection. With experience there has been improvement in avoiding folds and blurring artifacts.

Conclusion: As work experience increased with CEM we have reflected and changed practice accordingly to achieve better-imaging with better conspicuity of lesions and standards of mammogram.

Five-year audit of B3 lesions in a breast screening unit (North Cumbria Integrated Care NHS Foundation Trust)

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Introduction: Biopsy results of screen-detected breast lesions are categorised from B1 (normal) to B5 (malignant). The B3 category comprises lesions with uncertain malignant potential and varying malignancy rate (<2% to 40%). The NHS Breast Screening Programme (NHSBSP) has produced guidelines for the management of B3 lesions to reduce the benign open biopsy rate whilst maintaining the accuracy of cancer diagnosis. In order to prevent overdiagnosis and overtreatment, the recommendation for prevalence of B3 lesions is between 4 - 9%. NHSBSP pathology audit showed B3 to B5 upgrade rate (Positive predictive value, PPV) in England to be 9.7% and for B3 lesions with atypia to be 13.4%.

Methods: Retrospective audit of screen-detected B3 lesions between 1/4/2018 to 31/3/2023. Information regarding B3 prevalence, management, PPV and mammographic follow-up was obtained from NBSS, ICE, PACS and MDT proforma. The final outcome of B3 lesions was based on subsequent Vacuum Assisted Excision (VAE) or surgical excision.

Results: 92 B3 biopsy results were obtained from 1205 screen-detected biopsies. Diagnostic surgical excision was done in 2 cases where VAE was not technically feasible. The B3 prevalence rate was 7.63 %. The overall B3 PPV was 7.6%. The PPV for B3 with atypia was 13.7% and without atypia was 0%.

Discussion: This audit found that all B3 lesions were managed according to the guidelines. In addition, the B3 prevalence rate was within recommended standards. The B3 PPV rate was also comparable to published data. Annual follow-up mammograms of B3 cases so far have not identified any malignancy.

Can we safely non biopsy typical fibroadenomas in women aged 25–29 years?

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In patients under 25 years of age, a biopsy is not indicated for a presumed fibroadenoma if the following criteria are satisfied – ellipsoid shape, wider than tall, well-defined outline with fewer than four gentle lobulations, no calcification or shadowing and a thin echogenic pseudocapsule. We undertook a quality improvement project to determine whether a higher cut-off age of 30 years may be used for presumed fibroadenomas which meet the criteria above.

Retrospective data collection and analysis of patients who had a biopsy and are between 25-30 years old from 2019-2023. Correlation of imaging grade and histology and review of imaging of a subgroup of patients who had a malignant lesion on biopsy histology to assess if the lesions were truly benign (U2) on imaging.

Between January 2019 and December 2023, 219 patients aged 25–30 years underwent core biopsy. 96.2% (151/157) of radiologically benign lesions were histologically confirmed B2 lesions, 1.3% (2/157) were B1 lesions and 3 (1.9%) were B3 lesions. 0.6% (1/157) was histologically confirmed to be B5 lesion but on retrospective review the lesion had been incorrectly classified as U2 on ultrasound with a synchronous U5 lesion present in the same breast and two suspicious lymph nodes. All other cancers were scored as indeterminate or suspicious on ultrasound with a cancer incidence of 2.3% in this age group.

This study provides evidence for increasing the biopsy age threshold to 30 years in patients with clinical and sonographic features of fibroadenoma when a set of strict criterias are met.

Artefacts in breast ultrasound imaging

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Imaging artefacts can be caused by operator technique, machine settings, normal anatomy and pathology. Understanding how to avoid unnecessary artefacts yet optimise artefacts for diagnostic gain is important to the clinician.

This pictorial educational poster will explain and illustrate ultrasound artefacts that are helpful, avoidable and detrimental in diagnostic breast ultrasound, including typical artefacts to help localise clips and markers.

Artefacts illustrated include: posterior acoustic enhancement, acoustic drop out, edge enhancement, twinkle artefact, air artefact, mirror artefact, foreign bodies and snowstorm artefact from silicon. Helpful hints on optimising technique to utilise or avoid artefacts will also be discussed.

Comparing the effect of breast density and masking index on human reader and artificial intelligence performance in breast cancer screening

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This study uses 17755 raw full-field digital mammograms (FFDM) from a single breast cancer screening center over one year. For each FFDM, volumetric breast density was assessed using Volpara software, and masking score was assessed using the masking risk prediction Mammatus. AUC values were used to determine whether breast density or masking score is better able to discriminate between controls (normal FFDMs) and cases (interval cancer FFDMs). Optimal thresholds were found from ROC plots, applied to the year cohort and tested as thresholds for recall.

Grouping of density and masking scores into quartiles showed moderate agreement between the two tools. Sensitivity of readers within quartile groups of increasing breast density are as follows: 0.75 (0.51-0.91), 0.71 (0.54-0.83), 0.62 (0.41-0.80), 0.48 (0.34-0.62). Sensitivity of readers in quartiles of increasing masking score are as follows: 0.79 (0.54-0.94), 0.62 (0.44-0.78), 0.59 (0.42-0.74), 0.55 (0.40-0.69). Breast density and masking score are strongly negatively correlated with reader sensitivity, assessed with Spearman's Rank Analysis. ROC curves yielded an AUC of 0.67 (95% CI 0.637-0.695) for breast density and 0.65 (0.615-0.676) for masking score (p=0.75). Optimal density threshold of >9% resulted in a recall of 23% with a sensitivity of 0.5 (95% CI 0.349-0.651), and specificity of 0.77 (0.76-0.78). Optimal masking score threshold of >0.43 reported a recall of 21.7% with a sensitivity of 0.39 (0.251-0.546) and specificity of 0.79 (0.779-0.794).

Our results suggest both Volpara and Mammatus can predict degradation of reader sensitivity and predict the likelihood of lesion masking.

What lies outside the breast- incidental extra-mammary findings on MRI

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Background: Breast MRI has superior anatomical resolution and larger field of view than other breast imaging techniques and is the only one to include extra mammary structures. According to previous studies 16.8%–34% of breast MRI examinations demonstrate incidental extra mammary findings. Benign lesions are the most common findings. Malignant lesions need to be excluded especially as many breast MRI patients have newly diagnosed breast cancer and such significant findings would influence patient management. The aim of this study was to determine the prevalence and site of extra mammary findings on breast MRI.

Method: Retrospective review of all Breast MRI's over a 12 month period from January to December 2022 in a single institution was performed. 929 examinations were reviewed.

Results: Extramammary incidental findings were identified in 98 of the 929 examinations (10.5%). 6.1% were malignant findings (3 lung, 2 bone, 1 liver); one was a new diagnosis of sarcoidosis (1/98, 1%), one was a chest wall intramuscular myxoma(1/98,1%) and one a deep venous thrombosis (1/98,1%). The most common incidental finding was hepatic cysts 61.2%(60/98). The next most common findings were retrosternal goitre, hepatic haemangioma and cardiovascular findings each identified in 6/98 6.1%.

Conclusion: When reporting breast MRI it is essential to examine and review extra-mammary structures to exclude the presence of findings which might have a significant clinical impact on patient management and care.

A tale of two biopsy techniques: Comparison of Contrast Enhanced Mammography- guided breast biopsy versus MRI-guided breast biopsy.

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Introduction: MRI-guided biopsy is well established as a safe and accurate technique to obtain histology from non-palpable breast lesions that are not detected on conventional imaging. However, it has many inherent drawbacks including high cost, long procedure time, limited availability at only a few specialist centres leading to potential delays in the patient pathway. Our unit recently implemented Contrast Enhanced Mammography guided biopsy (CEMGB) using contrast enhanced mammography alongside conventional stereotactic guidance. This allows targeting of lesions that are occult on conventional imaging but visible on recombined images providing a potential alternative to MRI guided biopsy.

Methods: We present a comparison of CEMGB versus MRI guided biopsy with respect to equipment, logistics, patient selection, technique, workflow, procedure time, patient tolerability, complications and contraindications.

Results: CEMGB is a versatile alternative to MRI guided biopsy with potential for accurate diagnosis. It can be scheduled on the same day as a second look ultrasound should ultrasound fail to identify a correlate, uses stereotactic equipment already available at breast units and is less costly, easily available, faster, well tolerated by patients.

Discussion: CEMGB can be used as an alternative to MRI guided biopsy. It offers the potential for an accurate sampling of lesions occult on conventional imaging, using stereotactic principles familiar amongst radiographers and radiologists. This versatile technique is cheaper and faster than MR guided biopsy and furthermore offers potential for diagnosis at initial patient attendance avoiding delays in the patient's diagnostic pathway.

Does PERFORMS help improve breast screening reader performance?

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Introduction: All breast screening readers in the NHS Breast Screening Programme are required to participate in the PERFORMS external quality assurance scheme, which assesses mammography interpretation ability using a carefully collated set of mammograms with known outcomes(1-2). The aim of the current study was to evaluate whether reader performance in PERFORMS improves with more participation in the scheme.

Method: In this retrospective study, performance of breast screening readers on a single PERFORMS test-set, completed in 2022, was compared between readers with variable previous PERFORMS experience. Readers were grouped by the number of previous test-sets completed, from first time participants to participants who had completed ≥7 sets. The Jonckheere-Terpstra test was used to investigate any correlation between number of sets completed and cancer detection (CD), correct return to screen (CS) and area under the receiver operating characteristic curve (AUC).

Results: 681 readers completed the PERFORMS test-set. CD increased significantly with the number of previous sets completed, with first time participants scoring an average of 86.6% compared to 92.1% for participants with ≥7 previous sittings ($p<0.0001$, $r=0.27$). AUC based on pathology also increased significantly with the number of PERFORMS sittings ($p<0.0001$, $r=0.30$). No significant trend was identified for CS ($p=0.64$, $r=0.02$).

Discussion: Reading performance improved significantly with the number of PERFORMS tests undertaken. It's expected that other factors such as years of experience(3) (which naturally increase with the number of PERFORMS tests completed) also affect this relationship, but participation in performance tests like PERFORMS is valuable to contribute to improving reader performance.

Distribution of compressed breast thickness across large-scale real-world screening mammography dataset

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Introduction: Screening mammography is key to early breast cancer detection. During a mammogram, a paddle is used to compress the breast. Compressed breast thickness (CBT) is the distance between the paddle and the image receptor. Image quality impacts lesion detection; in general, image quality degrades as CBT increases. This study aims to assess the distribution of CBT values among a large real-world dataset.

Methods: Anonymized data from screening mammography exams performed between 01/01/2024-03/31/2024 was collected from 4,288 mammography systems across all 50 US states and the District of Columbia. The CBT value for each screening mammography view (left craniocaudal (LCC), right craniocaudal (RCC), left mediolateral oblique (LMLO), right mediolateral oblique (RMLO)) was extracted for each exam. Descriptive statistics across all exams and by state were reported. State-level correlations of CBT and percent obesity, and CBT and median income, were assessed.

Results: The analysis included 2,453,963 screening mammography exams. CBT appeared to follow a normal distribution, with a median of 6.2cm (all views), 6.0cm (CC views), and 6.5cm (MLO views). CBT values were >6.0cm and >8.0cm for 58% and 11% of all views, respectively. These proportions were higher for MLO views: 64% of CBT values were >6.0cm and 15% were >8.0cm. State-level CBT was moderately correlated with percent obesity (adjusted $R2=0.42$) and median income (adjusted $R2=0.32$).

Discussion: In this analysis, a substantial proportion of exams had high CBT values. It is important to ensure high-quality images at all CBT levels to ensure a robust and equitable breast cancer screening program.

Prevalence of Suspicious Mammographic Calcifications in Newly Diagnosed Breast Cancer Patients at Aga Khan University Hospital, Nairobi.Kenya

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Introduction: Breast cancer is a significant public health concern in Kenya, particularly in Nairobi, where incidence rates are notably high. Early detection is crucial for reducing mortality rates and improving prognosis. Mammography, detecting suspicious calcifications, plays a pivotal role in diagnosis.

Method: This cross-sectional study retrospectively analyzed data from newly diagnosed breast cancer patients at Aga Khan University Hospital, Nairobi, over a three-year period starting from November 2016. Mammographic images, histopathological data, and clinical information were reviewed.

Results: Among 139 patients, the prevalence of suspicious mammographic calcifications was 40%. Calcification morphology varied, with 44% showing coarse heterogeneous and 29% fine pleomorphic patterns. In terms of distribution, 42% had grouped, and 44% had segmental distributions. Notably, 18% had calcifications alone, while 82% were associated with a mass. Almost all ductal carcinoma in situ (DCIS) cases (10 out of 11) presented with suspicious calcifications.

Discussion: The high prevalence of suspicious mammographic calcifications underscores the importance of screening mammography in early breast cancer detection. Furthermore, identifying these calcifications is crucial for determining the extent of surgical intervention. Larger studies are recommended to explore the association between mammographic calcifications and breast tumor characteristics further

Clinical recalls in the West Devon and East Cornwall Breast Screening Programme – are thresholds for recall appropriate?

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Introduction: NHSBSP guidance states significant breast symptoms or signs should be recalled despite normal mammography. Local experience increasingly suggests some symptomatic women are choosing screening rather than GP review.

Clinical recall (BA) has low cancer detection and, thus, may be an unnecessary use of resource, causing undue anxiety.

The aim of this review was to analyse local BAs to identify criteria for safe reduction of BA rate.

Method: All BAs from 1/4/19 to 31/3/23 were obtained from NBSS by the Programme Manager. The Mammographer-completed client sheet, NBSS assessment record and mammograms were reviewed.

Results: Of 3552 recalls over the 4 years, 221 (6.2%) were purely clinical (lump 178(80.5%), distortion 18(8.1%), nipple changes 11(5%), axilla 9(4.1%), hardness 5(2.3%).

Symptoms were due to cancer in only 4 (1.8%; cf 24.1% in cases recalled for mammographic abnormality) - 2 from 178 lumps (1.1%), 1 hardness (20%), 1 distortion (5.6%) (cf). Of the 4 cancers, 2 had BIRADS density C, 1 BIRADS-B with implants and 1 was too medial for inclusion on mammograms.

Regarding cancer detection and density, of 66 BIRADS-A: 0 cancers, 85 B: 1 (implants and retrospectively visible), 54 C: 3, 14 D: 0 and 2 Mx: 0.

Discussion: As expected, cancer detection for BA was low. Given findings, we propose locally that BA is not used in BIRADS density A or B, unless implants or symptom site unlikely to be included on mammograms. A leaflet stating the national guidelines regarding normal results should be given as a failsafe.

Using PERFORMS to tune the recall threshold for breast cancer detection artificial intelligence (AI) algorithms

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Introduction: To optimise the effectiveness of cancer detection artificial intelligence (AI) algorithms in breast screening, the recall threshold must be set to achieve an appropriate trade-off between recall rate and cancer detection rate. Using data from the PERFORMS external quality assurance (EQA) programme, we propose a method to tune the recall threshold of a commercial AI algorithm, based on human reader performance.

Method: From April 2022-November 2022, NHS breast screening programme (NHSBSP) readers completed a PERFORMS test-set containing 60 mammography cases. This set was also evaluated by an AI algorithm (Lunit INSIGHT MMG v1.1.8.0) in July 2023. Humans scored cases from 1-5, as per Royal College of Radiologists 5-point scoring, and AI scored on a continuous probability of malignancy scale between 0-100. Readers were split by screening site to investigate how reader performance varied at site level. The recall threshold was adjusted for each site by matching to human reader sensitivity and specificity.

Results: 725 NHSBSP readers completed the PERFORMS test-set. The mean human sensitivity and specificity overall was 85.9% and 82.5%, respectively. For readers at each of the three screening sites investigated, the mean sensitivity varied slightly, with scores of 90.4%, 88.9%, and 91.5%. To match these scores, the AI recall threshold could be set at 17 for sites 1 and 3 and 20 for site 2.

Discussion: Using PERFORMS data, we noted variation in reader performance at different NHSBSP screening sites and showed that the AI recall threshold could be tuned to match readers at specific sites.

Audit of computed tomography (CT) incidental breast findings

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Introduction: Following a presumed increase in the number of referrals to triple assessment breast clinics from incidental CT findings, an audit was performed as part of the development of a potential new breast imaging review pathway. The aim of this audit was to identify the types of referral, number of breast cancers identified and if referrals could have been avoided if recent breast imaging was available for review.

Method: A PACS key word search of all CT reports featuring the word 'breast' between 01/01/2023 and 22/04/2024 was conducted. Those with known breast cancers were excluded from the audit.

All identified cases were reviewed using PACS to assess CT reports, clinical referrals for breast imaging and any subsequent breast imaging reports.
Relevant pathology reports were reviewed in the pathology reporting system ICE.
PACS images were reviewed to confirm stable findings.

Results: 129 cases were identified as mentioning a breast finding in the CT report.
94 of these were recalled for further imaging in triple assessment clinics. On clinical examination 8 were found to have P4 and P5 lumps.
33 patients underwent core biopsy.
21 breast cancers were identified (19 invasive, 2 in-situ disease).

Discussion: Of those who didn't have biopsy, 40 had undergone breast imaging within the last 6 years. 28 had stable findings compared to recent imaging. These patients could have avoided further assessment in breast clinic. The establishment of a breast imaging review pathway could avoid unnecessary clinic visits and free up appointments for those at most need.

Cancers detected from Consensus Arbitration.

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Introduction: Double reading screening mammograms without arbitration or consensus does increase the recall rate but can increase cancer detection rate by 6%–15% when compared with single reader reporting[1]. To reduce unnecessary recalls for assessment, a process of consensus or arbitration can be used for discordant results. All mammograms discussed at consensus over a three year period, were reviewed identifying cancer detection rate, cancer types and mammographic features.

Method: A retrospective study of arbitrated mammograms from 2021 to 2023 were reviewed. Arbitrated mammograms were recorded for routine screening or recalled to assessment. Assessment outcomes were documented for cancer types and mammographic features.

Results: A total of 1,178 women with discordant mammographic findings were discussed. 449 women were recalled for assessment. A total of 54 cancers were detected. Invasive ductal carcinoma was the most dominant type of cancer accounting for 17 cases. Mammographic features were recorded as asymmetric density, micro calcifications, stromal deformity, mass lesion or others. The most common mammographic feature resulting in discordance was an asymmetric density accounting for 40 cases.

Discussion: Consensus arbitration is proving to detect a range of cancer types with invasive ductal carcinoma being the most common and asymmetric density the most common mammographic feature. Cancers detected through arbitrations are beneficial for film readers to review, highlighting subtle cancers and film reading traits.

MRI Breast Audit: Indications for pre-treatment breast MR imaging and impact on patient pathway

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MRI can have a huge impact on breast cancer management however additional investigations can also arise with minimal impact on treatment.

This primary aim was to assess whether breast MRI was performed with appropriate clinical indications as per RCR guidelines. Secondary aims included mapping additional investigations arising, overall time to start treatment from day of referral (day 0) as per NHS 62-day treatment targets and change to surgical plans.

All patients with a new cancer diagnosis over a 1-year period at University College London Hospital between December 2022 and December 2023 were assessed.

110 patients were assessed - 70 had an appropriate clinical indication. 62 out of 110 patients had additional findings on MRI of which 51 had additional imaging. Of the 51 who had additional imaging 23 had no sonographic correlate and 17 had MRI-guided biopsy.

Overall, of the 110 patients assessed 34% had treatment within 62 days of referral. 10/110 had a change to their surgical plan post breast MRI with 1 appropriately indicated and 2 possible unnecessary mastectomies with post op histology showing smaller disease extent than MRI estimate.

A significant number of patients were having MRI studies not indicated as per RCR guidelines. Only 1/3 of patients were meeting the 62-day treatment target. 10 patients had a change to surgical plan of which only 1 was appropriately indicated. This raises the discussion on whether widespread use of MRI may have a negative impact on treatment pathways in breast cancer and whether greater exploration is needed.

Desmoid Fibromatosis of the breast. A case report based discussion on clinical, imaging presentation and lesion management.

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Introduction: Fibromatosis is a benign, spindle cell lesion which forms in the fibroblast cells of connective tissue. It can occur anywhere in the body, most commonly, the abdominal wall but is rare in the breast comprising of 0.2% of lesions. It is reported as mimicking malignancy on mammography and ultrasound imaging (1,2) and management is equally as challenging as, although benign, there is a 29- 39% risk of local recurrence (3).

Method: Case reports are depicted of 4 women aged between 29 and 65 years of age. Consisting of 3 women who attended the symptomatic breast clinic with a breast lump, and one detected as an abnormality on screening mammography. The clinical presentation, imaging, and management will be discussed.

Results: In all 4 cases, mammography and ultrasound appearances of fibromatosis overlapped with that of malignant breast lesions, however careful and representative core biopsy was sufficient for histological differential diagnosis.
Management of these rare lesions was discussed with the sarcoma multidisciplinary team on an individual basis, due to risk of recurrence and lack of national guidelines.
Discussion: Fibromatosis could be considered as a differential diagnosis in irregular lesions on ultrasound, particularly in younger women.

Recommended management is traditionally surgical excision with margins. However current literature is advocating a move to a more "watch and wait" approach (4,5,6,7).

The top 100 most cited articles on artificial intelligence in breast radiology: a bibliometric analysis

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Introduction: Artificial intelligence (AI) in radiology is a rapidly evolving field. In breast imaging, AI has already been applied in a real-world setting and multiple studies have been conducted in the area. The aim of this analysis is to identify the most influential publications on the topic of artificial intelligence in breast imaging.

Methods: A retrospective bibliometric analysis was conducted on artificial intelligence in breast radiology using the Web of Science database. The search strategy involved searching for the keywords ‘breast radiology’ or ‘breast imaging’ and the various keywords associated with AI such as ‘deep learning’, ‘machine learning’ and ‘neural networks’.

Results: From the top 100 list, the number of citations per article ranged from 25 to 333(average 69). The highest cited article titled ‘A Deep Learning Mammography-based Model for Improved Breast Cancer Risk Prediction’ was published in Radiology in 20191. 96 of the articles were published in the last 10 years. The journal with the most number of articles was Radiology (n=21). The most common country of origin was the United States (n=40). The most common keywords were ‘artificial intelligence’, ‘CAD’ and ‘deep learning’. Commonly occurring topics published were the use of deep learning models for breast cancer detection in mammography or ultrasound, radiomics in breast cancer and the use of AI for breast cancer risk prediction.

Discussion: This study provides a comprehensive analysis of the top 100 most-cited papers on the subject of artificial intelligence in breast radiology and discusses the current most influential papers in the field.

Analysis of the language demographics of patients attending Beaumont Breast Clinic

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Introduction: Due to the changing demographics in Ireland in recent years, many patients attending the breast clinic in Beaumont Hospital do not speak English as their first language. Studies show that language barriers lead to miscommunication between the doctor and patient and reduced job satisfaction for healthcare staff1. In 2023, €4649 was spent on interpreters in the breast clinic in Beaumont. This audit assesses the language demographics of patients attending symptomatic breast clinic with the aim of identifying the translation requirements of the service and to assess if we are meeting the standards set by the Health Service Executive(HSE)2. Currently, patient information leaflets are available in Russian, Portuguese, Polish and Chinese in the clinic.

Method: Questionnaires were given to all patients attending the breast clinic imaging department in April-June 2024.

Results: 1208 patients' responses were analysed. 604/1208(50%) were aged 36-50years. 244/1208(20%) were born outside Ireland. 215/1208(18%) responded that English was not their first language. Of the patients who spoke a foreign language as their first language, 142/215(66%) could understand and read English. 30 different native languages were listed as a first language; the most common were Polish(31), Portuguese(22), Ukrainian(21) and Lithuanian(19).

Discussion: This data indicates that the changing language demographics is a significant problem that needs to be addressed. In our department, we discovered that we need to create leaflets in more languages to reflect the change in patient population. Additional resources such as translation software should be considered in addition to traditional in-person translators to allow greater flexibility.

Beware! B2 Benign

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Breast lesions with indeterminate characteristics, categorized as R3, pose a diagnostic challenge in breast radiology. These typically undergo biopsy, and a B2 result is usually considered benign. However, uncritically accepting a B2 result can lead to significant risks, as this case series illustrates.

Case 1: A 66-year-old female with a history of renal cell carcinoma had a new M3 lesion in her right breast. Initial biopsy indicated a B2 fibroadenoma, but due to discordant imaging findings, a stereotactic biopsy was performed, confirming the B2 result. She was discharged but returned 18 months later with an enlarged lump, which was diagnosed as malignant phyllodes, requiring a mastectomy. She later developed metastatic disease.

Case 2: A 58-year-old female presented with a P4 lump in her right breast. Initial biopsy showed fibrotic and cystic components (B2). Due to discordance, a follow-up was scheduled, revealing an increase in lesion size. A re-biopsy diagnosed HER2+ grade 3 invasive ductal cancer. She underwent neoadjuvant chemotherapy with a complete response.

Case 3: A 58-year-old female's screening mammograms showed a gradually increasing lesion. Initial biopsy confirmed a fibroadenoma. She returned 21 months later with a 10 cm lump, diagnosed as borderline/malignant phyllodes. She underwent surgery, and histology confirmed borderline phyllodes.

These cases highlight the risks of under-staging and undertreatment associated with accepting B2 biopsy results without further scrutiny. A multidisciplinary approach, thorough clinical history, and a low threshold for early follow-up or repeat biopsy are essential, especially in postmenopausal women, to ensure accurate diagnosis and optimal patient care.

Imaging features of papillary carcinoma of the breast

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Introduction: Papillary carcinoma of the breast is a rare cancer seen predominantly in postmenopausal women. We present an educational poster of a large series of papillary cancers describing the imaging features with pathological correlation.

Method: A retrospective case-control study of radiological features in patients with confirmed pathological diagnosis of papillary cancer was conducted. The radiology information system generated a list of patients with confirmed diagnosis of papillary cancer from January 2015 to March 2024. The cancers were categorised into five subtypes: solid in situ, solid invasive, encapsulated in situ, encapsulated invasive and invasive micropapillary cancers. The imaging features for each subtype was then identified using the BI-RADS classification across mammography, ultrasound (US) and MRI.

Results: 110 patients were identified with confirmed pathological diagnosis of papillary cancer; 18 were excluded (no radiological images available to review, alternative diagnoses or benign post-surgery). Of the 92 patients, the mean age was 71 years, with one male patient. The majority of these patients (68.5%) had invasive disease, the remaining in situ disease (31.5%) and lymph node involvement (17.4%). Imaging assessment was carried out with US (95.7%), mammography (90.2%) and MRI (16.3%).

Discussion: Radiological-pathological correlation identified common imaging features within each subcategory of papillary cancers which will be described and illustrated in the poster. The aim of this poster is to help radiologists recognise the differential diagnosis and management of these rare but important lesions.

Diagnostic challenges in the case of Neuroendocrine tumour of the breast

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Primary neuroendocrine carcinoma of the breast is very rare accounting for less than 1% of all breast cancers (1), presenting as both primary and metastatic lesions. It is more common for this type of tumour to arise in the gastrointestinal tract or bronchopulmonary system. 'The diagnosis of a primary neuroendocrine tumour is always a diagnosis of exclusion, and that the existence of tumours in other localisations must be ruled out' (2). There are very few reported cases of neuroendocrine breast cancer and no unique radiological features.

This is a case study of primary neuroendocrine carcinoma within the breast which initially presented as axillary metastasis only. Additional imaging including CT, MRI and PET, and specialist neuroendocrine opinion, resulted in a complex diagnostic pathway.

Impacts of an Artificial Intelligence (AI) Service Evaluation Trial for Breast Screening on the Human Screen Readers.

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Introduction: The North Yorkshire Breast Screening Service took part in a 6-month Service Evaluation of an AI Mammography Reading tool. How did the trial effect the human readers, both as individuals and as a group?

Method: AI Software ‘read’ screening mammograms in the background alongside the normal reading process for a 6-month period.
Cases in which the AI had recalled the case and human readers had not were reviewed. A decision was made about whether to then recall the case or not. In cases of dispute a majority vote was taken for the decision.

Results: There was trepidation knowing that the software was being used in the background, and we considered our own thresholds for recall more carefully in this time.

Average time taken for the review meetings was around 2-3 hours, these were held every 2 weeks. There were huge numbers of cases to review as the AI software had a low threshold setting for recall.
In difficult cases, a majority vote was taken for the final decision.

Discussion: The potential introduction of the use of AI in breast screening is widely discussed. This service evaluation highlighted the impacts that this may have on the human film readers working in the service.

How we felt as individual film readers and how we interacted as a team to make collective decisions was put under the spotlight, and there may have been lasting impacts on our clinical practice as a result.