



safe. A 25 minute research scan protocol can easily be achieved within a total door-to-door transfer time of 90 minutes. Feedback from NHS clinicians responsible for these patients' care is uniformly positive. Responses from study participants at follow up are also positive. Confidence has been gained scanning this small cohort and 2 future ITU based studies with intubated/ventilated patients are due to start in 2015.

#### **P043 A case of pulsatile tinnitus, visual blurring and diplopia**

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57 year-old ophthalmology nurse presented with a one year history of left sided pulsatile tinnitus. She was admitted with increasing left sided retro-orbital pain, proptosis and diplopia.

On examination she had a left abducens nerve palsy, visual acuity 6/9 in the right eye and 6/18 in the left eye. A bruit was heard over the left eye.

On CT there was prominence of the petrous and cavernous segments of the left internal carotid artery. There was early filling of the left superior ophthalmic vein which was dilated and also the left superficial sylvian vein, pterygoid venous plexus and left inferior petrosal sinus. Appearances were suggestive of a left carotid-cavernous fistula.

Diagnostic angiography by the left internal and external carotid arteries demonstrated a brisk fistula supplied predominantly by the ascending pharyngeal artery in the region of the left hypoglossal canal draining into the varicosity of the inferior end of the inferior petrosal sinus.

A venous catheter was placed at the base of the right inferior petrosal sinus and microcatheter was then navigated via the inferior petrosal sinus, right cavernous sinus, intercavernous connections to the left cavernous sinus, down the left inferior petrosal sinus to the varicosity. A series of coils were then placed within the right varicosity and lower inferior petrosal sinus to the point of occlusion until there was stasis within this vessel. At this point the fistula appeared to be completely occluded.

The clinical and radiological features of the case will be presented, and educational points will be highlighted.

### **Clinical: Breast**

#### **P044 Bright things in the breast on ultrasound - not always benign. A pictorial review of the possible causes**

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**Introduction:** According to the BIRADS classification, an echogenic lesion in the breast is defined as a lesion that is more hyperechoic than the fat in the subcutaneous tissue in the breast. Conventionally, all hyperechoic lesions on ultrasound were thought to be benign. However, a recent study by Linda et al showed that hyperechoic lesions are mostly benign but can rarely be malignant (0.5% cases) 1, 2.

**Aims:** This study looks at both benign and malignant hyperechoic lesions of the breast and aims to reiterate that echogenicity on ultrasound alone is not solely a criterion for distinguishing between benign and malignant lesions. The characterisation of lesions on ultrasound must be made on the basis of the most worrisome finding.

**Content:** Here, we discuss a range of benign hyperechoic breast lesions such as haematoma, fat necrosis, sebaceous cyst, hamartoma, lipoma, abscess, nodular fasciitis and malignant hyperechoic lesions of the breast such as ductal carcinoma in situ, invasive ductal cancer, invasive lobular cancer, metaplastic cancer, angiosarcoma and papillary intracystic carcinoma of the breast.

**Conclusion:** Any echogenic lesion on ultrasound needs to be correlated with clinical features, mammographic changes, location of the lesion and demographics. Lesions with suspicious features on ultrasound and mammography need to be biopsied to establish the diagnosis.

#### **References:**

Anna Linda et. Al., AJR, May 2011



Yiming Gao et. Al., RSNA Radiographics, Mar-Apr 2013

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**P045 Not everything 'bright' on breast ultrasound is 'benign'**

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**Learning objectives:**

1. To be aware of the causes of hyperechoic lesions on ultrasound of the breast
2. To describe the diagnostic features of common benign echogenic lesions which require no further intervention
3. To identify the infrequent malignant lesions which can mimic benign lesions, thereby avoiding misdiagnosis.

**Content:** On ultrasound of the breast, solid hypoechoic lesions often indicate significant or sinister pathology requiring further investigation. In contrast, most solid hyperechoic lesions are benign and include entities such as lipoma, fat necrosis, echogenic cyst and hamartoma. However, echogenic breast lesions can occasionally indicate sinister abnormality and require further intervention. We describe the spectrum of echogenic lesions of the breast, highlighting the features which may help distinguish between benign and malignant causes and change further management.

**Summary:** This poster reviews the spectrum of echogenic breast lesions with an emphasis on unusual malignant echogenic entities.

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**P046 Shear-wave elastography as an adjunct to magnetic resonance and ultrasound scanning in the investigation of breast disease**

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**Aim/objectives:** Mammograms are currently the 'gold standard' in breast imaging, with magnetic resonance imaging (MRI) and ultrasound (US) utilised as adjuncts, however, these modalities have yet to achieve 100% sensitivity and specificity in the detection of, and distinction between, malignant and benign breast pathology. This review evaluates the emerging technique of shear-wave elastography (SWE) as an adjunct in both US and MRI breast imaging.

A literature search of published studies obtained from Cochrane Library, Science Direct and Scopus between 2005 and 2014 was performed.

**The content of the presentation is to:**

- Help illustrate the technical properties of SWE
- Describe how its application as an adjunct may improve overall specificity
- Present the need for further research to establish the role this emerging technology may have in breast imaging.

**Relevance/impact:** To increase awareness of the potential of SWE as an adjunct to MRI and US. It is hoped this will generate further interest in researching the potential of this technology.

**Outcomes:** The reviewed literature demonstrated that SWE can provide quantitative measurements of tissue elasticity, increasing specificity in US and MRI by up to 18% and 15% respectively.

**Discussion:** Several studies have demonstrated that incorporation of SWE during US and MRI breast imaging has increased specificity between occult and benign lesions. However, compared to large-scale studies undertaken on US elastography, there is a paucity of studies into its application in MRI. Nonetheless, the outcome of this review emphasises the need for future research into the application of SWE.

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**P047 Do false positive breast screening results inhibit future screening attendances?**

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**Background:** Breast screening is a valuable method of detecting breast cancer in its early stages and saves approximately 1,400 lives per year. Research outside of the UK suggests that women's longitudinal engagement with screening is negatively affected by a false-positive screening result; reasoning adverse psychological consequences inhibit future engagement. Such reduced engagement is costly at both an individual level and to screening units through lost revenue.

**Aim:** To investigate whether false-positive breast screening results have a negative effect on women's subsequent screening re-attendance.

**Method:** Data were gathered from one breast screening unit in London of all women who had been recalled following initial screening for further investigation in 2009/2010 (n=1659). Their attendance at the next screening-recall date in 2012/13 was analysed to explore trends in non-attendance - linked to demographic information. Ethical approval was obtained.

**Results:** 1,299 (78.3%) women received false-positive results 2009/10. Of these 16.8% (n=279) did not attend 2012/13. Univariate logistic regression was conducted to examine the influence of age, false-positive results and ethnicity in 2009/10 to see if they predict attendance at future screening. Findings were significant and were; baseline, 62.9%; including age variable, 69.3%; including false-positive test result, 81.5%, ethnicity, 62.9%.

**Conclusion:** False-positive screening results do have a negative effect on women's subsequent engagement with the screening programme, awareness of these trends afford individual units the insight to tailor service to the demography of local service users and improve engagement.

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#### P048 Incidence of internal mammary node (IMN) lymphadenopathy in primary breast cancer

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**Aims/objectives:** To establish the incidence of IMN adenopathy on CT in primary breast cancer patients within one year of diagnosis.

**Content:** A retrospective cohort study of all spiral CT thorax performed on breast cancer patients within 12 months of diagnosis from January 2009- December 2012. The number and size of any IMNs were recorded.

**Relevance/impact:** The importance of IMNs in the staging and treatment of breast cancer is disputed. Lymphoscintigraphic studies demonstrated a significant proportion of breast cancers have primary or partial IMN drainage. Historical studies demonstrated no overall benefit of treating IMNs with surgery or radiotherapy. However with recent advances in treatment; targeted radiotherapy of the IMN chain, is possible.

**Outcomes:** 830 patients were diagnosed with primary breast cancer within our time frame; 150 patients were included. 42% (62) had IMNs present, the majority were small (<5mm), however, 16% (25) had larger nodes >5mm. We identified sole IMN involvement in 13 (8.7%) patients; 3 (2.0%) were greater than 5mm. Medial cancers did not predispose to IMN adenopathy.

**Discussion:** We demonstrated that IMNs are present in a substantial number of our primary breast cancer patients. In up to 8.7% of cases this was the sole site of potential disease spread identified on CT. These patients may be undertreated if IMNs are not identified. We suggest that routine imaging of the IMN chain as well as axilla should be considered in the staging of all breast cancer.

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#### P049 Stereotactic clip placement error - a retrospective study

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To identify the range and causes of stereotactic clip placement error, with the aim of improving accuracy of surgical excision biopsy.

A retrospective study of 59 patients who underwent either vacuum or core biopsy, between November 2012 and May 2014. Pre and post biopsy films were compared and the distance of the target lesion from clip was measured. A



cut-off of 10mm was used to identify outliers, which were reviewed to identify procedural differences between accurate and inaccurate placement.

Increasing use of vacuum biopsy and core biopsies of subtle lesions has increased our requirement for stereotactic marker clip placement. In addition, we intend to implement Radioactive Iodine 125 seed localisation. Understanding and minimising procedural errors in clip misplacement are therefore paramount.

We demonstrated that the largest error occurred in the plane orthogonal to the compression plane (Z axis). 80% of errors were positive, meaning clip placement was inserted too far. No difference in error was demonstrated between vacuum and core biopsies. We have no case evidence of 'clip migration'.

We showed clip position may differ substantially from the biopsy target, exacerbated by the 'accordion effect'. Apart from slippage, no clear cause for inaccuracy was determined from the pre-deployment 'swing pair' films though overshoot in either film and a diffuse target are factors. Post-biopsy mammography should be performed in two orthogonal planes for early demonstration of clip placement inaccuracy. We believe that a method for orthogonal correction of radioactive seed introducer placement is required for this procedure to succeed.

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#### **P050 Breast calcification: Does size matter? A retrospective audit to identify the appropriateness of biopsy in small cluster breast microcalcification**

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**Aims/objectives:** This audit aims to determine whether those screening mammograms, performed at the Bolton Breast Unit, containing calcification of less than 5mm go on to have benign pathology and could therefore avoid recall to assessment clinic and subsequent biopsy.

**Content:** The background to the audit will be introduced as well as the methods explained. A thorough review of results and associated discussions will then be presented.

**Relevance/impact:** Breast calcifications are calcium salt foci that may occur anywhere in breast tissue. They are non-palpable, asymptomatic and can indicate benign or malignant disease. They are increasingly diagnosed within the NHS breast screening programme due to the introduction of digital mammography. Increasing diagnosis has led to an increase in the number of stereotactic biopsies performed. These are a safe way to ensure sufficient tissue is obtained for diagnosis. Increasing biopsies lead to increasing workload and costs for units providing this service as well as increased anxiety for the women.

**Outcomes:** Of 295 women biopsied, 70 had microcalcification less than 5mm. 37 patients with 4-5mm calcification were benign but 8 women with microcalcification 4-5mm had pathology of B3 or B5. 25 women with calcification 3mm or less showed benign pathological diagnoses.

**Discussion:** Number of biopsies performed could be reduced by 10% which equates to savings of £3000-6000 per year, additionally preventing anxiety surrounding further intervention. Further retrospective research needed to assess whether trends are similar with larger population. Stereotactic core biopsy could be avoided in screening population with breast microcalcification less than 3mm unless significant history; proving beneficial for the unit and the patient.

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#### **P051 Evaluation of Hierarchical Clustering-based Segmentation (HCS) as a perception aid for mammogram readers**

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Hierarchical Clustering-based Segmentation (HCS) identifies edges of a lesion and heterogeneous regions within. This study evaluated how HCS process's following outputs aid in the visualisation of the details within the abnormalities in mammographic images:

- Boundary outlined dissimilar regions
- Heat map of the dissimilar regions



- Highlighted dissimilar regions.

In an online survey, six mammograms containing a suspected lesion were presented. Participants were asked to examine the suspected lesion and mark its extent, first using only the DICOM images to assist them (condition 1) and again with the HCS process outputs (condition 2).

HCS processing confirms the heterogeneous nature of seemingly homogeneous tissue. HCS process's more appropriate delineation of the heterogeneous regions within abnormalities and the results of this study suggest that this impacts on the diagnostic reading when there is ambiguity in the lesion borders. This might aid better perception of the abnormality, targeting a biopsy to the core of suspected abnormality and the monitoring of tissue during and after treatment to assess the effect of drug and/or radiotherapy.

Differences in the lesion measurements and the inter-subject reliability were compared between the two conditions. When the images were divided into lesions with distinct or diffuse borders, there was a significant change in the absolute differences in the lesion measurements when the lesion borders were indistinct, but not in the images where the lesion borders were clearly defined.

HCS, by clearly defining tissue edges, enables the observer to see what lies within an area of suspicious breast tissue.

#### **P052 Radiographer reporting of magnetic resonance imaging breast examinations: findings of an accredited postgraduate programme**

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**Aim:** To present the objective structured examination (OSE) results of the initial cohort of radiographers (n=4) who successfully completed the first postgraduate course (accredited by the College of Radiographers) which prepared radiographers to report magnetic resonance imaging (MRI) investigations of the breast.

**Method:** 25 MRI investigations (prevalence of abnormal cases approximately 50%) were used in the OSE which included the following appearances: malignancy (mass; multi-focal disease; nipple and/or lymph node involvement); benign cysts; implant rupture (intra and extra capsular); and normal breast (with and without implant).

The radiographers indicated if the appearances were normal or abnormal and provided a description and interpretation of any abnormal appearances. Responses (n=100) were compared to the expected answers previously agreed with a consultant radiologist external examiner. Sensitivity (Sn) and specificity (Sp) rates were calculated on the normal/abnormal decision and the total percentage agreement rates were calculated using a pre-determined marking scheme.

**Results:** The mean % rates (and 95% Confidence Intervals) for sensitivity, specificity and agreement were 94.0% (90.1 – 97.9); 92.5% (88.8 – 96.2) and 86.8% (82.5 – 91.1), respectively. Most common false positive and false negative errors were: lymph node involvement, fibroadenoma, implant rupture.

**Conclusion:** These results suggest that this group of radiographers can report MRI breast examinations to a satisfactory level of competence to be of benefit to clinical departments committed to achieving recent guidelines. Further work is required to confirm the clinical application of these findings.

#### **P053 Mammography in a nutshell for FRCR**

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##### **Learning objectives:**

- To understand how a mammographic image is produced
- To interpret normal, abnormal and artefactual findings on the mammogram
- To appreciate how mammography is used in both symptomatic and screening settings.

**Content:** All radiology trainees undergo core breast training as part of the FRCR curriculum, and may encounter breast imaging cases as part of the 2A and 2B examinations. As well as a good understanding of mammographic



physics, technique and normal anatomy, trainees need to be able to interpret normal, abnormal and artefactual findings on the mammogram. An appreciation of how mammography is used in the screening and symptomatic settings is also important.

**Summary:** Here we provide a short revision aid for all radiology trainees, covering the essentials of mammography for the FRCR examination.

## Clinical: Chest

### P054 CT features do not predict histological diagnosis in lung cancer

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With the emergence of new treatments specific to histologic sub-types of lung cancer, the rapid assessment of likely histological sub-type without invasive testing would be attractive. We have carried out a retrospective analysis of CT features to establish whether particular CT features are predictive of histology.

Two hundred consecutive patients with biopsy proven lung cancer were identified. Demographic characteristics and CT features were analysed by fifteen variables, including age, sex, size, shape and location of tumour. The analysis was carried out blind to the eventual histologic diagnosis. A logistic regression was then carried out.

Small cell lung cancer was significantly more likely to present with smoothly marginated masses situated solely within or close to the mediastinum and significantly less likely to contain central cavitation or air bronchograms. However, no other correlation between tumour type and CT features was identified. It appears that CT scanning alone has little role in determining histological sub-type.

### P055 Patient reported experiences of CT guided lung biopsy: A prospective cohort study

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**Background:** CT guided lung biopsy is a commonly performed procedure to obtain tissue for a histological diagnosis in cases of suspected lung cancer.

**Methods:** This is a prospective cohort study to obtain information directly from patients about their experiences of the biopsy procedure, thus obtaining a more accurate picture of complications compared with previously performed retrospective reviews. Patients participated in a post-procedure telephone interview and information was gathered about any procedural complications and personal experiences. We also compared the patient reported complications with those obtained from a retrospective review of hospital databases, analogous to previously performed retrospective studies.

**Results:** In our patient group, reported procedural complication rates were 10% pneumothorax rate (4% requiring a chest drain) and 10% haemoptysis. Post-procedural pain and shortness of breath showed positive correlation, with one patient experiencing prolonged pain. No statistical difference was found between the patient reported complication rates and those obtained from retrospective review of the hospital database.

**Conclusions:** Our study demonstrates CT guided lung biopsy is a safe procedure and is generally well tolerated. Some patients may experience significant and lasting pain and should be counselled about this pre-procedure.

### P056 Imaging for cancer in patients with unprovoked pulmonary emboli: The one-year Oxford Experience

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*Oxford University Hospitals NHS Trust*

**Purpose:** In 2013, the British National Institute for Health and Care Excellence recommended that in patients with unprovoked PE "consider further investigations for cancer with an abdomino-pelvic CT scan in all patients aged over 40 years...who do not have signs/symptoms of cancer based on initial investigation or a known diagnosis of cancer."