Clinical: Breast

P-040 **Mucinous carcinoma and fibroadenoma case study**

Claire Mercer; Valerie Reece
University Hospital of South Manchester NHS Foundation Trust

Aims/objectives: To investigate the possibility of the misdiagnosis of mucinous breast cancer for a common benign breast lesion eg., a fibroadenoma in the younger age group.

Content: 36 year old patient attended the symptomatic clinic with a palpable lump in the inner half of the right breast and a family history of breast cancer. It was initially thought to be a fibroadenoma but later confirmed by histology to be a mucinous carcinoma.

The case study includes images and reports of the following: mammogram, ultrasound, FNA, core biopsy, axilla ultrasound and pathology slide.

The patient was listed for WLE and sentinel node biopsy. The histology report demonstrated an invasive mucinous carcinoma grade 2. There were 0/1 lymph nodes with no lympho-vascular invasion. Low grade cribriform DCIS was also present.

Relevance/impact: There is a potential for misdiagnosis when two breast pathologies exhibit similar appearances on imaging and could have an effect on the correct outcome for the patient.

Outcomes: The MDT decision recommended adjuvant Radiotherapy and Endocrine therapy (Tamoxifen 20mg per day for 5 years). Local recurrence is a problem with mucinous carcinoma so good margins are required. The patient is awaiting radiotherapy and has been referred for egg preservation.

Discussion: The possibility of misdiagnosis can arise due to the fact that pure or nearly pure mucinous carcinoma accounts for no more than 2% of all breast cancers and it occurs more so in older women. This case study discusses other diagnostic differences between fibroadenoma and mucinous carcinoma.

P-041 **A mammography image set for observer training and assessment in BI-RADS density classification**

Claire Mercer; Peter Hogg; Judith Kelly; Rita Borgen; Sara Millington; Beverley Hilton; Patsy Whelehan; David Enion
University Hospital of South Manchester NHS Foundation Trust; University of Salford; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; Medical Research Institute University of Dundee; Burnley General Hospital

Aims/objectives: Breast density categorisation consistency is important when performing research where density is a relevant variable. Minimisation of inter and intra-operator variability is essential if findings are to be meaningful. This research aimed to validate a set of mammography images for visual breast density estimation to help achieve consistency in future research projects, and to determine observer performance (inter- and intra-observer agreement).

Content: A set of 50 film-screen mammograms was scored twice by each of eight observers, using the American College of Radiology BI-RADS (Breast Imaging Reporting and Data System) four-category density scale. Scoring agreement within and between observers was assessed.

Relevance/impact: This exercise has set a gold-standard score for the test set and enabled the observers' scoring consistency to be evaluated. This will facilitate rigour in future research where BIRADS mammographic density scores are relevant.

Outcomes: Six of eight observers achieved strong intra-observer agreement (Cohens' Kappa >0.81). Strong agreement between paired observers was demonstrated in 10 of 28 pairs on first scoring round, and 12 of 28 on second. No observers demonstrated a delta variance above 1. Fleiss' Kappa was used to evaluate concordance between all observers on first and second scoring rounds, with values of 0.64 and 0.56 respectively.

Discussion: We confirmed the 50 images suitable for observer training and assessment for research purposes. Some variability existed between observers, but density classification agreement was strong overall. Further work includes repeating this study for digitally acquired images.

P-042 **Factors affecting the reducibility of ADC measurements in breast cancer**

Lukasz Priba; Shelley Waugh; Sarah Vinnicombe

Medical Physics, Ninewells Hospital, Dundee; Division of Cancer Research, University of Dundee

Introduction: Magnetic Resonance Imaging (MRI) Apparent Diffusion Coefficients (ADC) are sensitive to therapy-induced changes in lesion cellularity, and their use as a biomarker is under evaluation. However little data is available on factors affecting ADC measurement reproducibility. This study characterised the uncertainty in ADC values arising from scanner instability, scan-to-scan variation and measurement repeatability.

Methods: All scanning was performed using a 3.0T MRI scanner.

Scanner stability was investigated using an ice-water phantom scanned weekly for six weeks using a standard diffusion sequence (b=50,800s/mm2, voxel size: 1.8×1.8×4mm).

Scan-to-scan reproducibility was assessed by measuring ADC values in 10 healthy volunteers, scanned twice, 4 weeks apart. Axial images were anonymised and randomised, and ADC measured at nipple level in homogenous parenchyma.

Measurement repeatability was assessed using standard diffusion images from 46 patients with biopsy-proven cancer. Whole-tumour ADC was measured by two observers (technical and clinical) and repeated after one week.

Results: Scanner stability was excellent with an average ADC=1.089×10-3mm2/s and coefficient of variance of 6.6%. The coefficient of reproducibility (CoR) for the healthy volunteer breast parenchyma was 8.0% with average ADCBASELINE=1.503×10-3mm2/s and ADCFOLLOW-UP=1.544×10-3mm2/s and intra class correlation (ICC) coefficients of 0.811. In clinical, symptomatic patients, inter-observer repeatability was 17% and 11.1% for clinical and technical observers respectively. The inter-observer repeatability was CoR=0.302×10-3mm2/s (ICC=0.939;30.0%).

Conclusions: Inter-observer variability was the biggest factor affecting ADC measurements with CoR measures resulting in up to a 30% error of the average measurement value. This should be considered in departments with multiple reporting radiologists or in multi-centre studies.

P-043 **Visibility of cancer mimicking lesions in a poly vinyl alcohol (PVAL) breast phantom using mammographic imaging – relationship between phantom thickness and lesion visibility**

MS Ossati ; Katy Szczepura; Ana Marono; Gunvor Wade; Julie Wilkinson; Kim Boerma; Paul Sanderson; Sanne Kramer; Susanne Evensen; Vanja Harsaker; Peter Hogg

School of Health Sciences, University of Salford; Optimax Summer School

Purpose: To determine the relationship between lesion visibility and phantom breast thickness in mammographic imaging.

Method and materials: Two PVAL phantoms, each containing a contrast enhanced lesion, were evaluated. The mechanical and x-ray attenuation properties of the phantoms and lesions were similar to fatty breast tissue and malignant disease. Images were obtained, under different thicknesses, using FFDM. Lesion visibility was assessed using visual analysis of the brightness and contrast using a 2 alternative forced choice (2AFC). The lesion size was measured and the contrast to noise ratio (CNR) was calculated.

Results: All results demonstrated a non-linear relationship between phantom thickness and lesion visibility. The initial thickness was 45mm.

The average 2AFC score in Phantom 1 ranged from 3.43 - 6.29 with the highest value at a thickness reduction of 40%. The average score for brightness and contrast in Phantom 2 ranged from 3.86 - 6.86 with the highest value at a thickness reduction of 62%.

The CNR in Phantom 1 ranged from 3.00 - 9.68 with the highest value at a thickness reduction of 62%. The CNR in Phantom 2 ranged from 4.29 - 10.69 with the highest value at a thickness reduction of 49%.

A linear relationship was shown between thickness reduction and the area of the lesion.

Conclusion: For the deformable phantom, using 2AFC, lesion visibility increases as thickness reduces to a certain point beyond which lesion visibility deteriorates. Further research is necessary to understand why visibility deteriorates.

P-044 **A call for client consistency in compression**

Claire Mercer; Peter Hogg; Katy Szczepura; Judith Kelly; Rita Borgen; Erika Denton; Sara Millington; Beverley Hilton

University Hospital of South Manchester NHS Foundation Trust; University of Salford; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; University of East Anglia and Norfolk & Norwich University Hospital; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital

Aims/objectives: The application of mammographic compression force is influenced by the practitioner which may affect client experience. This study establishes if practitioners vary in compression force application, and the resultant compressed breast thickness, at 3 NHS Breast Screening Service (NHSBSP) sites.

Content: Each site provided data from 3 consecutive screens for 500 clients and recorded: practitioner code, compression force(N), breast thickness(mm), BI-RADS® density. Exclusion criteria: breast surgery, previous/ongoing assessment, breast implants. 975 clients met the inclusion criteria: 2925 images. Variation of compression force(N) and breast thickness(mm) were analysed.

Relevance/impact: Demonstrated that practitioners vary in compression force and resultant compressed breast thickness applied at different NHSBSP sites.

Outcomes: Compression force varied significantly between sites. Site 1 had three varying practitioner compressor groups each significantly different to each other. Site 3 had a protocol for required minimal compression of 100N.

Results: Sites 1&2 demonstrated no significant difference in mean, 1st & 3rd quartile compression force and breast thickness values CC($p>0.5$), MLO($p>0.1$); with sites 1&3 and sites 2&3 demonstrating a significant difference($p<0.001$).

Discussion: The amount of compression force applied by practitioners and the resultant compressed breast thickness is not consistent across these 3 sites. Certain standardisation is found when guidance dictates minimum force in site 3. This may have a positive impact on image quality comparisons over time, radiation dose, potentially cancer detection. A large variation could negatively impact on patient experience; varying pain each attendance; potentially reducing rates of re-attendance and cancer detection. NHSBSP standards required to guide practitioners to ensure consistency in image quality and re-attendance over screens.

P-045 **The role of magnetic resonance image guided 2nd look ultrasound - effecting change in management for patients considered for breast conserving surgery**

Nikhil Rao; Praveen Varra; Muthyala Sreenivas
University Hospitals Coventry & Warwickshire NHS Trust

Introduction: Magnetic Resonance Imaging (MRI) guided second look ultrasound (US) is an established technique for detecting areas of suspicious breast tissue adjacent to a primary breast carcinoma and distinguishing solitary from multifocal disease. It has the advantage of being able to identify and sample these lesions. This has a key role in determining whether breast conserving or mastectomy is performed.

Methods: A retrospective study of 50 cases in which MRI guided 2nd look breast ultrasounds was carried out over the period of 30th December 2011 to 3rd of July 2013 (18 months, 240 total MRIs). 90% of 2nd look US were performed by single MRI reporting radiologist. Data was analysed for 29 cases from our institution with completed information. This included; correlation between MRI and US findings, histology results and whether patient management was impacted, in terms of solitary or multifocal disease and subsequent treatment.

Results: Second look US was performed in 23 cases (2 cases excluded as these were not malignant). 17 out of 21 (81%) patients had positive US of which 14 patients had additional malignancies, resulting in a change in management (wider excision/mastectomy) in 82% of cases in which US was positive. US failed to identify 4 lesions (4 cases) seen on MRI and required further MRI guided biopsy - from which 3 were histologically benign.

Conclusion: We have demonstrated that MRI guided 2nd look US is effective for the detection of incidental further tumour foci and a cost effective method of altering patient management.

P-046 **MRI in the breast screening programme**

Chris Loughran; Orla McAvinchey
East Cheshire NHS Trust

Introduction: When an abnormality is identified on screening mammograms women are invited to re attend for further assessment of the putative abnormality. Standard evaluation includes physical examination, further mammography, ultrasound and needle biopsy. Magnetic resonance mammography (MRM), traditionally, has little

part to play. However, we have noted increasing numbers referred for MRM from the screening programme. This paper is a retrospective evaluation where we sought to determine the reasons for the MRM referral.

Method: A retrospective evaluation of all women referred for MRM from the local breast screening programme.

Results: 26 screening ladies had MRM over a 7 month period. 7 (27%) were for lobular carcinoma, 7 (27%) for disease extent prior to surgery, 6 (23%) where biopsy was not technically possible or where there were non compliance issues and 5 (19%) where additional reassurance was sought by the patient or referring surgeon.

Conclusion: There is demand from the breast screening programme in patients where more accurate evaluation of disease is sought. This is so with lobular neoplasia where multifocal disease may be occult and DCIS where standard imaging may be misleading. In ladies where conventional techniques point very heavily towards a benign diagnosis then MRM may be sufficient to allow a more conservative policy by, for example, follow up only. Finally some cannot tolerate biopsy or where a biopsy is technically demanding and in such instances MRM can be reassuring and allow a conservative approach.

P-047 **Comparative study of prognoses in screening and symptomatic Asian breast cancer patients based on Nottingham prognostic index**

Anil Jain; Alexander Stewart; Sigrid Whiteside; Alix Hartley; Jacqueline Serevitch
University Hospital of South Manchester NHS Foundation Trust

Aim: To study prognostic differences in three groups of Asian breast cancer patients depending on age and presentation:
I) Screening >47yr
2) Older symptomatic > 47 yr
3) Younger symptomatic <47 yr

Material and Methods: Our study includes 100 Asian breast cancer patients (81% invasive, 19% DCIS) diagnosed between 2009-2013. These include:
Screening: 21 {13 (62%) invasive, 8 DCIS}
Older symptomatic: 44 {36 (82%) invasive, 8 DCIS}
Younger symptomatic: 35 {32 (91%) invasive, 3 DCIS}

For 81 invasive cancers tumour grade, size, lymph node involvement, ER/PR and Herceptin receptors status and Ki-67 have been recorded and Nottingham Prognostic Index (NPI) calculated. The screening histories of eligible patients have also been obtained.

Results: Asian women with screening detected breast cancer have a better prognosis than both the symptomatic groups with smaller average size, lower grade and less nodal involvement. However, there was poor screening attendance in older symptomatic Group.

The mean NPI (±SD) is 3.81 ± 0.96 for screening detected Group and 4.76 ± 1.18 for older symptomatic Group . This difference is statistically significant (p=0.008).

The mean NPI for younger symptomatic Group is (4.56 ± 1.23) and is not statistically significantly different from older symptomatic (p=0.528). The symptomatic tumour prognostic features are mixed with greater proportion of high grade tumours in younger symptomatic Group and more lymph node involvement in older symptomatic Group.

Conclusions: Asian women with screen detected breast cancer have the best prognoses. Older symptomatic patients however have poorer prognoses similar to younger symptomatic patients, highlighting the need that screening eligible Asian women should not miss their screening appointments.

Clinical: Chest

P-048 **Lung cancer screening at a glance**

Sze Mun Mak; Simon Padley
Chelsea and Westminster Hospital NHS Foundation Trust

Lung cancer screening with low dose CT is a current hot topic within thoracic radiology. National Lung Screening Trial (NLST) showed promising results of a 20% mortality reduction in the United States. European trials are also under way, which will soon offer more evidence of mortality benefit of lung cancer screening. These include the