BREAST IMAGING and NEW IMAGING MODALITIES- A Surgeons view

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Breast Imaging

• Women with breast symptoms must be referred for diagnostic assessment, not to breast screening services
• Women < 35 Years- bilateral ultrasound is the initial imaging modality
• Women > 35 Years– bilateral mammogram and bilateral US
PRESENTATION

• ULTRASOUND
• MAMMOGRAPHY
• DIGITAL BREAST TOMOSYNTHESIS
• MRI

BREAST ULTRASOUND

• Less sensitive than mammography
• More useful in ladies with dense breasts
• Not for screening
• Well established for triple assessment
• Operator dependent
• Diagnosis of malignancy
  75% sensitive and 97% specific
• Differentiation of solid from cystic lesions
Simple cysts

- Localised collection of fluid
- Peak incidence 30–50 years
- Very common: 7% women will present with a palpable cyst in their lifetime
- Single or multiple, hormone responsive
- Usually disappear after menopause unless using HRT
Complex cysts

Sonographic diagnosis
5% of cysts are complex
Rate of malignancy is 0.3%
Internal echoes – blood or septae
(Category 2)
Intra-cystic nodule or thickened wall
(Category 3)

Complex cyst with nodule

- Fluid requires ultrasound guided aspiration
- Solid component requires ultrasound guided core biopsy
Fibroadenoma

- 12% of all symptomatic breast masses
- Peak incidence: 20 - 30 year age group
- Cause unknown: ? hormonal
- Overgrowth of benign breast elements - both stroma and epithelium
- Solitary or multiple
- Round or oval, firm, smooth, mobile, may be tender on clinical examination
- More common Asian / African women

Management:

- Surgical Excision vs Surveillance
  - Age
  - Risk Profile
  - Patient anxiety
  - Increase in size of lesion
  - Atypical features on pathology
  - Atypical features on imaging
  - Size > 2.5cm –
  - PHYLOIDES TUMORS
BREAST CANCER

MAMMOGRAPHY

BREAST SCREENING –WOMEN >40 YEARS (TARGET – 50-74 YO)

FULL FIELD (2D) DIGITAL MAMMOGRAPHY FOR > 10 YEARS

CANCER DETECTION RATES IMPROVED
DESPITE THIS 10 % OF WOMEN ARE RECALLED FOR FURTHER INVESTIGATIONS
HOW ‘DENSE’ ARE YOU?

Mammography
false negative up to 50% in young women
DIGITAL MAMMOGRAPHY WITH 3D TOMOSYNTHESIS (DBT)

A sequence of successive images are acquired while the X-ray source travels along an arc, allowing multiple slices to be examined (0.5-1.0mm thin image slices).

3D RECONSTRUCTED IMAGES
( and a 2D synthesised mammogram can be digitally reconstructed)
DBT - the X-ray tube moves in an arc across the breast – 15/30 degrees- low dose xrays are then reconstructed to give depth information
1. 3D Mammography is proven to be effective. Multiple studies in 2014 showed 3-D mammography to be a highly accurate screening tool for detecting breast cancer with fewer false positive results. It’s not widely available yet, but the growing evidence suggests we’ll see more adoption in 2015. Hologic, one of two U.S. companies selling 3-D mammography machines, told TIME there’s growing interest, with at least one of their machines in all 50 states.

3D MAMMOGRAPHY WAS RANKED AS TIME MAGAZINE’S 11TH MOST REMARKABLE HEALTH ADVANCE IN 2014

DIGITAL TOMOSYNTHESIS
Right Breast - CC + MLO views – C VIEWS

Tomosynthesis Movie – CC and MLO
MLO C VIEW + Tomosynthesis movie

EFFECTACY OF DBT

Reduces false positives- Normal overlapping tissue, on standard digital mammogram can mimic breast cancer, DBT adds depth resolution to prevent this problem.

Reduces false negatives- in digital mammogram overlapping breast tissue can obscure and mask cancers.

BONUS -
LESS COMPRESSION REQUIRED !!!!
WHAT ABOUT THE RADIATION DOSE?

2D AND DBT – increases radiation exposure TWO-FOLD
This is still BELOW SAFETY LIMIT

BACKGROUND RADIATION IN AUSTRALIA – 1.5-3.0 millisieverts/year
Digital Mammogram – 0.5- 0.7 millisieverts
Digital Mammogram and DBT- 1.0 -1.4 millisieverts
Adding DBT is equivalent to up to 6 months of annual background radiation (BUT with C view reformatted DBT – DOSE=4 MONTHS)
REFORMATING THE DIGITAL MAMMOGRAM

• REDUCES THE RADIATION DOSE OF DBT TO ALMOST THAT OF A STANDARD DIGITAL MAMMOGRAM

• NEED TO CHECK WITH RADIOLOGY COMPANY, LOOK ON THE FILMS – IS IT A C VIEW?

• EXCEPTION – DBT CAN EXAGGERATE MICROCALCIFICATIONS – STANDARD MAG VIEWS WILL BE REQUIRED

HAVE WE BEEN ‘TRUMPED’?
“We’re gonna make this Country great again”

IN THE USA DBT HAS BEEN SHOWN TO -
Improve cancer detection rates
Reduces patient recalls

Approved for screening
BREAST SCREEN AUSTRALIA POSITION STATEMENT, November 2014

“... TWO-VIEW MAMMOGRAPHY CONTINUES TO BE THE MOST EFFECTIVE POPULATION PRIMARY SCREENING TEST FOR BREAST CANCER .......... THERE IS EVIDENCE THAT DBT CAN BE OF BENEFIT IN AN ASSESSMENT SETTING ...... LESS SUPPORTING EVIDENCE FOR THE BENEFIT OF DBT AS THE SCREENING TEST FOR POPULATION SCREENING OF WELL WOMEN.”
ISSUES WITH DBT

An increase in cancer detection rates do not indicate a MORTALITY benefit.
Still uncertain if DBT results in a REDUCTION in interval cancer rates.
CONFLICTING EVIDENCE ON WHETHER BREAST DENISTY IMPACTS ON ACCURACY OF DBT

MOST BENEFIT OF DBT
REDUCE FALSE POSITIVE RECALLS AND MINIMISE OVER INVESTIGATION

NEW MODALITY-
Contrast Mammography

NOT WIDELY AVAILABLE
SPECIALIST REFERRAL ONLY
IODINE CONTRAST – OVER 2 MINS- CAN MISS VERY HIGH GRADE TUMOURS
RELIANCE ON NEOVASCULARISATION – may miss low grade tumors/DCIS
SPECIALIST RADIOLOGIST REPORTING

“WATCH THIS SPACE”
CONTRAST MAMMOGRAPHY = POOR MANS MRI
BREAST MRI

• USES MAGNETIC FIELDS TO CREATE AN IMAGE OF THE BREAST TISSUE, USING HUNDREDS OF IMAGES TAKEN VERY QUICKLY

• NO RADIATION
• No mortality/survival data
• No RCTs

• NO evidence it is more effective than mammography and US in the screening of women over the age of 50
• NO evidence of survival benefit with the use of MRI
• BREAST MRI is not a substitute for mammogram

Breast MRI

Very high sensitivity for the detection of breast cancer
• >90% IDC/ILC
• DCIS- 80-90%
• Implant Rupture- 94%

Vast majority of malignant lesions enhance
Breast MRI

Lower specificity
• ~ 30 – 60% PPV
Some benign lesions enhance

Normal breast parenchyma may enhance, (day 6-16 cycle is best)

Early + late in cycle benign hormonal enhancement
Patient Positioning

1-Dec-16

Benign Breast Disease Symposium 2016
Medicare MBS eligibility

<50 yrs of age
To be eligible for rebate MUST be ordered by breast specialist

- Breast or ovarian ca 3 or more 1st/2nd deg relatives, same side family
- Breast or ovarian ca 2 or more 1st/2nd deg on same side family plus 1 or more of:
  - bilateral breast ca
  - onset breast ca < 40 yrs
  - onset ovarian ca < 50 yrs
  - both breast and ovarian ca in one relative
  - Ashkenazi Jewish ancestry
  - male breast cancer relative
- Breast cancer onset < 45 yrs 1st/2nd deg relative plus 1 bone / ST sarcoma < 45 yrs 1st/2nd deg same side family
- Genetic mutation BRCA1, BRCA2 or P53

NB. Not included: Radiation treatment to the chest for Hodgkin’s Disease

ACS MRI Guidelines

Recommend Annual MRI Screening (Based on Evidence)*)
BRCA mutation
First-degree relative of BRCA carrier, but untested
Lifetime risk ~2%-25% or greater, as defined by BRCAPRO or other models that are largely dependent on family history

Recommend Annual MRI Screening (Based on Expert Consensus Opinion†)
Radiation to chest between age 10 and 30 years
U-Fraumeni syndrome and first-degree relatives
Cowden and Bannayan-Riley-Ruvalcaba syndromes and first-degree relatives

Insufficient Evidence to Recommend for or Against MRI Screening‡
Lifetime risk 15-20%, as defined by BRCAPRO or other models that are largely dependent on family history
Lobular carcinoma in situ (LCIS) or atypical lobular hyperplasia (ALH)
Atypical ductal hyperplasia (ADH)
Heterogeneously or extremely dense breast on mammography
Women with a personal history of breast cancer, including ductal carcinoma in situ (DCIS)

Recommend Against MRI Screening (Based on Expert Consensus Opinion )
Women at <15% lifetime risk

Saslow D et. al. CA Cancer J Clin 2007; 57; 75
DIAGNOSTIC MRI

- Extent of Disease- ipsilateral and contralateral- synchronous, multifocal or multicentric disease
- Positive margins
- Response to neoadjuvant chemotherapy
- Metastatic Axillary Lymphadenopathy of unknown primary (75-80%)
- Chest wall invasion
- Recurrent breast cancer / scar changes

- USA – 5% WOMEN > 30 HAVE HAD AN MRI BREAST

Limitations and Problems with MRI

- Contra indications- METAL
- Patient claustrophobia/Noisy/ obesity / prone position
- Pregnancy - gadolinium contrast contra indicated (no RCT)
- Breast feeding - cease for 24hrs - interpretation difficult- esp for lobular CA + DCIS - diffuse enhancement not circumscribed
  IV line - midazolam / accompanied by an adult
- Anaphylaxis rate - 0.03%
- Time consuming- 25 minutes
- Scheduling difficulties (day 6-16 menstrual cycle)
- Mass < 5mm too small to characterise
- Limited trained technologists- expert, experienced interpretation
- MR guided biopsy time consuming/ EXPENSIVE
FALSE NEGATIVES with MRI

TECHNICAL CAUSES-
Breast tissue not included in the coil, motion, inadequate contrast, too much compression
Marked Background enhancement

CAUTION
IF MAMMOGRAPHY OR ULTRASOUND IS POSITIVE OR PALPABLE FINDINGS NEED TO TREAT/ BIOPSY / EXCISE DESPITE NEGATIVE MRI!

ALL THAT ENHANCES ON MRI ISN’T CANCER

• DUCTAL ENHANCEMENT

• MALIGNANT CAUSES- DCIS / INVASIVE CA

• BENIGN HIGH RISK LESIONS- ADH, LCIS

• BENIGN – FIBROSIS, DUCTAL HYPERPLASIA , FIBROCYSTIC CHANGE
Juvenile FA

Lobulated FA

Pre contrast show presence of fat in a lesion

Fat-containing hamartoma with central high signal on T1WI (arrow)
CYSTS – show up as a filling defect

SPICULATED MASS > 80% chance malignant
CAD- Computer Aided Detection - KINETIC EVALUATION-
large invasive cancer

CAD with a large area of type 3 enhancement

LEFT BREAST CANCER
INVASIVE CANCER with linear DCIS

RIGHT AXILLARY METASTASIS

Enhancing large lymph node (arrow) in a patient with breast cancer
Diagnosis

> Mammogram + US > 35 years, (Ultrasound< 35 )
> ? MRI- young/ dense/ lobular CA/ occult mammogram-SPECIALIST REFERRAL
> Biopsy
> Staging Investigations

The BREAST radiologist is your friend!
Dr. Anthony Felber
Breast Imaging is a TEAM SPORT - MULTIDISCIPLINARY CARE