Decrypting mammography: benign vs suspicious patterns

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Learning Objectives

1. Understanding BiRADS mammography and correlating to pathophysiology
2. BreastScreen Australia and its role in screening
3. Guide clinical management and follow up of breast lesion using BiRADS
Breast Cancer

- In Australia, breast cancer is the most commonly diagnosed cancer (excluding non-melanoma skin cancer)
- Second most common cause of cancer death in Australian women
- Over past 30 years, the incidence of breast cancer in Australian women has increased significantly
- Morbidity and mortality has decreased significantly during the same period

This is due to early detection and screening through BreastScreen Australia Program and improvement in breast cancer management and treatment.
Breast tissue pathology

Epithelium
- Lobules and terminal ducts
- Lactiferous ducts

Connective tissue
- Intralobular
- Interlobular

Atypia - histological resemblance to carcinoma insitu, <50% cells of ducts or lobules are affected
Breast tissue terminology

Morphological changes
- Cysts: dilation of lobules
- Fibrosis: cyst rupture causing chronic inflammation of surrounding tissue
- Adenosis: increase number of acini

Malignant changes

Ductal system malignancy
- Atypical ductal hyperplastia
- Ductal carcinoma in situ

Lobular system malignancy
- Atypical lobular hyperplastia
- Lobular carcinoma in situ

Calcification: calcium deposits

Case: Mohammadtaghi Niknejad rID: 85394
**Composition of Breast**

<table>
<thead>
<tr>
<th>BiRADS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparing the density of glandular tissue to surrounding fat</td>
<td>Almost entirely fatty</td>
<td>Scattered areas of fibroglandular density</td>
<td>Heterogeneously dense, which may obscure small masses</td>
<td>Extremely dense, which lowers the sensitivity of mammography</td>
</tr>
</tbody>
</table>

Previous classification system as was ACR which classified according to percentage of glandular tissue. Shortfall was that low area percentage of dense glandular can still obscure small masses. BiRADS 2013: addresses this by comparing the glandular tissue to surrounding tissues.
BiRADS: A

Almost entirely fatty: little to none obscuring of small masses
BiRADS: B

Scattered areas of fibroglandular density
BiRADS: C

Heterogeneously dense, which may obscure small masses
BiRADS: D

Extremely dense, which lowers the sensitivity of mammography
Describing the lesion

Shape
The shape and symmetry of the lesion.

Margin
The regularity and outline of the lesion.

Density
The radio-opacity of lesion relative to the surrounding fibroglandular tissue.
Shape

Round
Case: Garth Kruger rID: 18788

Oval
Case: Alexandra Stanislavsky rID: 62455

Irregular
Case: M. Niknejad rID: 161500

Increase likelihood of benign lesion
Increase likelihood of malignancy
Margin

- Circumscribe
- Obscured
- Microlobulated
- Indistinct
- Spiculated

Increase likelihood of benign lesion
Increase likelihood of malignancy

Case: A. Stanislavsky rID: 62455
Case: William Lee rID: 161313
Case: Garth Kruger rID: 22386
Case: Frank Gaillard rID: 12608
Case: A. Stanislavsky rID: 62207
Density

Increase likelihood of malignancy

Increase likelihood of benign lesion

Fat containing

Low density

Equal density

High density

Case: Vivek Pai rID: 27023

Case: Garth Kruger rID: 27187

Case: A. I. Ranchod rID: 159490

Case: M. Niknejad rID: 157908
Calcifications
Benign calcifications patterns

**Large Rod**
- Calcium deposits in lactiferous ducts hence point towards nipple
- Plasma cell mastitis

**Rim**
- Calcium deposits around oil cysts or fat which has necrosed - center has different density

**Vascular**
- Calcium deposits along the walls of the vessels - linear appearing like train tracks

**Popcorn**
- Calcium deposits in end glandular tissue and stroma resulting in popcorn shapes - fibroadenoma

**Milk of calcium**
- Calcium layering within the cyst - looking like cups or cresents
Suspicious calcifications patterns

- **Amorphous**
  - Indistinct micro-calcifications
  - No shape or form
  - Usually associated with low grade

- **Coarse heterogenous**
  - Grouped macrocalcifications
  - Seen in invasive breast carcinomas

- **Fine pleomorphic**
  - "Crushed rock" appearance on left
  - <0.5mm
  - Can be variable shaped
  - Usually associated with high grade
  (Above: DCIS)
## Distribution of calcifications patterns

<table>
<thead>
<tr>
<th>Diffuse</th>
<th>Regional</th>
<th>Grouped</th>
<th>Linear</th>
<th>Segmental</th>
</tr>
</thead>
</table>
| • scattered randomly throughout the breast and usually benign | • scattered in a larger volume of breast tissue (>2 cm in greatest linear dimension)              | • at least 5 calcifications clustered within 1 cm from each other in an area (2 cm in greatest linear dimension)  
• more likely to be malignant if small (<1 mm) | • calcifications in a line suggestive of deposition along ducts                                  | • calcium deposits in ducts and branches of a segment or lobe                                     |
Lobular and Ductal Malignancy
Invasive breast carcinoma of no special type

Most common type of breast cancer. 70-80% of all breast cancers. Previously known as invasive ductal carcinoma, not otherwise specified.

Arises from the ducts:
- Branching out to surrounding tissue
- Extends along the ducts

Looks:
- Fine segmental and linear calcification along the ducts
- Circumscribed, spiculated mass
- Loss of architecture of the ducts and ductal extension
- Nipple retraction

BiRADS 5

Case: Mohammadtaghi Niknejad rID: 94040
Lobular carcinoma

Second most common type of breast cancer. 10-15% of all breast cancers.

Arises from the end lobules of the breast. As result of proliferation of small cells that lack cohesion:
- They are dispersed via fibrous connective tissue forming linear cords that invades the stroma
- Forming concentric circles around ducts

Looks:
- multicentric
- spiculated mass...can be irregular focal mass
- preserved architecture of the ducts
- bilateral

This means on mammogram...

Case: Mohammadtaghi Niknejad rID: 149763

BiRADS 5
BreastScreen Australia Program

Self examination

Educating people to be familiar with the normal look and feel of their breasts.

See doctor if there are:

- a lump or thickening of the breast
- breast skin changes, such as puckering, dimpling or a rash
- persistent or unusual breast pain
- change in the shape or size of a breast
- nipple discharge, nipple rash or a change in nipple shape

Screening mammography

Free screening mammography for women over age of 40, every 2 years.

Actively invite women aged 50-74 to screen.

- Reduced morbidity and mortality of breast cancer through early detection.
Risk assessment tool for mammogram, ultrasound and MRI.
Aims to:
• standardise reporting language
• Communicates risk
• Framework for follow up and diagnosis of breast cancer

How to sample tissue?
• Core biopsy
• Vacuum-assisted core biopsy
• Fine needle aspiration (FNA)
• Surgical biopsy

<table>
<thead>
<tr>
<th>Category</th>
<th>Likelihood</th>
<th>Next step</th>
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<tbody>
<tr>
<td>BI-RAD 0</td>
<td>Inconclusive</td>
<td>Further imaging</td>
</tr>
<tr>
<td>BI-RAD 1</td>
<td>Negative</td>
<td>Routine surveillance</td>
</tr>
<tr>
<td>BI-RAD 2</td>
<td>Benign</td>
<td>Routine surveillance</td>
</tr>
<tr>
<td>BI-RAD 3</td>
<td>Probably benign &lt;2% likelihood</td>
<td>Short interval follow up - 6 months, 12 months, 24 months</td>
</tr>
<tr>
<td>BI-RAD 4</td>
<td>Suspicious 4a: 2-10% likelihood 4b: 10-50% likelihood 4c: 20-95% likelihood</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td>BI-RAD 5</td>
<td>Highly suggestive &gt;95% likelihood</td>
<td>Tissue diagnosis</td>
</tr>
<tr>
<td>BI-RAD 6</td>
<td>Biopsy proven malignancy</td>
<td>Excision</td>
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</table>
Take Home Points

1. Higher densities of fibroglandular tissue can obscure lesions

2. Red flags in breast lesion characteristics include: irregular, spiculated and high density mass

3. Red flags in calcification patterns include: linear or segmental, amorphous and fine pleomorphic depositions

4. Encourage patients to regularly self examine their breast

5. BiRAD mammography is framework that helps guide next step in diagnosing breast cancer
References

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