EXCEPTS FROM LATEST ACR BI-RADS ATLAS (5TH EDITION)...

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Breast imaging in the 1980s

- Poor Quality
- Poor Reporting
  - Vague terms
  - Vague recommendations

- Need to standardise, measure and improve quality of radiology communication

ACR BI-RADS
Breast Imaging-Reporting and Data System
BI-RADS--- Important Components

- Lexicon: dictionary of terms
- Atlas to demonstrate the terms
- Report organization: Comprehensive multimodality reporting
- Clear final assessment categories
- Recommendation of the most appropriate management
- Data management and outcome audit
Report Structure... Mammography

- Indication for examination
- Description of the overall breast composition
- Clear description of any important findings
- Comparison to previous examination(s)
- Assessment
- Management
Breast Composition Categories

- a. The breasts are almost entirely fatty
- b. There are scattered areas of fibro glandular density
- c. The breasts are heterogeneously dense, which may obscure small masses
- d. The breasts are extremely dense, which lowers the sensitivity of mammography
a. Entirely Fatty
b. Scattered Areas of Fibroglandular Density
c. Heterogeneously Dense
d. Extremely Dense
Lexicon

- Only standard terminology
- No embellishments
- No ambiguity; AVOID appears to show, likely, noted, poorlymarginated
- Do not repeat the complete description in the final impression
Location and Labelling

**Figure 1. Clock face locations**

Right

- OUTER
- 12:00
- 9:00
- 6:00
- 3:00

Left

- OUTER
- 12:00
- 9:00
- 6:00
- 3:00

**Figure 2. Depth**

MLO

- Posterior
- Middle
- Anterior

CC

- Anterior
- Middle
- Posterior
Pictorial Depiction of finding is highly appreciated by the Surgeon
45 Y lady with palpable lump in Left breast UOQ

- Mass
- Architectural distortion
- Asymmetry
- Calcification

- Shape
  - Round
  - Oval
  - Irregular

- Margins
  - Circumscribed
  - Obscured
  - Microlobulated
  - Indistinct
  - Spiculated

- Density
  - High
  - Low
  - Isodense

- BI-RADS 1
- BI-RADS 2
- BI-RADS 3
- BI-RADS 4
- BI-RADS 5
- BI-RADS 6
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Likelihood of malignancy</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Incomplete</td>
<td>Unknown</td>
<td>Special views, US, MRI; comparison with old studies</td>
</tr>
<tr>
<td>1</td>
<td>Negative</td>
<td>No evidence of malignancy</td>
<td>Routine screening</td>
</tr>
<tr>
<td>2</td>
<td>Benign finding</td>
<td>No evidence of malignancy</td>
<td>Routine screening</td>
</tr>
<tr>
<td>3</td>
<td>Probably benign finding</td>
<td>Less than 2 % chance of malignancy</td>
<td>Follow-up imaging</td>
</tr>
<tr>
<td>4</td>
<td>Suspicious abnormality</td>
<td>2 to 95 % chance of malignancy</td>
<td>Biopsy</td>
</tr>
<tr>
<td>5</td>
<td>Highly suggestive of malignancy</td>
<td>Greater than 95% chance of malignancy</td>
<td>Biopsy</td>
</tr>
<tr>
<td>6</td>
<td>Known malignancy</td>
<td>100 % malignant</td>
<td>Definitive treatment</td>
</tr>
</tbody>
</table>
BI-RADS 4 – Big inhomogeneous Category

BIRADS-4

- BIRADS-4A
  Low Suspicion
  (2-10%)

- BIRADS-4B
  Moderate Suspicion
  (10-50%)

- BIRADS-4C
  High Suspicion
  (50-95%)
Why 4A, 4B, 4C?

- BIRADS 4 has a wide range (2%-95%) of probability of malignancy. Good to stratify into 4a, 4b and 4c
  - BIRADS 4A, 4B---- awaited results is benign
  - BIRADS 4C-------- awaited result is malignant

- Establish Imaging-histology concordance to minimize false negatives due to sampling error

- If the Bx result is nonconcordant--- Further action warranted (Repeat biopsy(VAB)/ Surgical excision)
BI-RADS 0 Category; Incomplete assessment

- Further imaging, prior films or additional information required to complete assessment
- Should include specific suggestions for the next course of action (spot-compression magnification views, US, etc)

*Category 0 should not be used for diagnostic breast imaging findings that warrant further evaluation with MRI. Final assessment should be assigned in a report that is made before the MRI examination is performed*
BI-RADS 1 Category; Negative for cancer

BI-RADS 2 Category; Negative for cancer

- Benign findings are described in the report
# BI-RADS 2 Category

<table>
<thead>
<tr>
<th>MAMMOGRAPHY</th>
<th>ULTRASOUND</th>
<th>DCEMRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popcorn calcification</td>
<td>Simple cyst</td>
<td>Simple cyst with no/periheral thin enhancement</td>
</tr>
<tr>
<td>Vascular calcification</td>
<td>Probable fibroadenomas noted to be unchanged at Follow up US studies</td>
<td>Post op scarring with no enhancement</td>
</tr>
<tr>
<td>Dermal calcification</td>
<td>Breast implants</td>
<td>Breast implants</td>
</tr>
<tr>
<td>Multiple secretory calcifications</td>
<td>Intramammary node</td>
<td>Multiple, bilateral diffuse enhancing foci</td>
</tr>
<tr>
<td>Fat containing mass</td>
<td></td>
<td>Fat containing mass</td>
</tr>
<tr>
<td>Intramammary node</td>
<td></td>
<td>Bilaterally symmetrical nonmasslike enhancement</td>
</tr>
<tr>
<td>Stable Post op scarring</td>
<td></td>
<td>Single focus + no washout + no BRCA</td>
</tr>
</tbody>
</table>
## BI-RADS 3 Category; Probably benign

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<th>MAMMOGRAPHY</th>
<th>ULTRASOUND</th>
<th>DCEMRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumscribed mass on a baseline mammogram</td>
<td>Complicated cyst</td>
<td>Abnormal focal enhancement likely due to hormonal influence</td>
</tr>
<tr>
<td>Focal asymmetry</td>
<td>Breast abscess</td>
<td></td>
</tr>
<tr>
<td>Solitary group of punctate calcifications</td>
<td>Solid mass with circumscribed margins, an oval shape, and parallel orientation</td>
<td></td>
</tr>
</tbody>
</table>
Management of BIRADS 3 lesions

Short interval follow-up imaging every 6 months for 2 years (watchful waiting)

- 95%, no growth, bx is avoided
- 2-3 %, a benign process grows, and requires bx to establish its nature
- 1-2 % are cancer, growth is seen on follow-up, and bx initiates treatment. Although some time is lost in the process, the cancers found at follow-up are usually still small and curable.

Biopsy may be performed in selected cases (patient preference or overriding clinical concern)
BI-RADS 3... Palpable vs nonpalpable masses

Palpable noncalcified solid breast masses with benign morphology at mammography and US can be managed similarly to nonpalpable BI-RADS category 3 lesions, with short-term follow-up (6-month intervals for 2 years)


BI-RADS 4 Category; Suspicious for malignancy

<table>
<thead>
<tr>
<th>BI-RADS 4A</th>
<th>BI-RADS 4B</th>
<th>BI-RADS 4C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid mass partially circumscribed with sonographic features suggestive of a fibroadenoma</td>
<td>Complex cystic and solid masses</td>
<td>Solid, irregular masses with illdefined margins</td>
</tr>
<tr>
<td>Complicated cyst or a breast abscess</td>
<td>Intraductal masses</td>
<td>Recent cluster of microcalcifications</td>
</tr>
</tbody>
</table>

Radio-pathological correlations should be precise: a partially circumscribed mass with ill-defined margins with a fibroadenoma result is acceptable, but in case of a diagnosis of papillary lesion, surgery should be proposed.
BI-RADS 5; Highly Suggestive of Malignancy

- A spiculated, irregular, high-density mass,
- Segmental or linear distribution of fine linear calcifications
- Irregular spiculated mass with pleomorphic calcifications
BI-RADS Category 6; Known Biopsy-Proven Malignancy

Biopsy proven malignancy (imaging performed after percutaneous biopsy but prior to complete surgical excision), in which there are no mammographic abnormalities other than the known cancer that might need additional evaluation.
Microcalcifications

- Perception of microcal is easy but.....
- Characterization is difficult

- Trick is to establish the location
  - Ducts----- Mostly malignant
  - Lobule-----Mostly benign
  - Outside the TDLU-------Definitely Benign

- Morphology and distribution provide clues to the location of microcal
## Microcalcifications Decoded

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>PPV for Malignancy</th>
<th>Appropriate BI-RADS Assessment Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse heterogeneous</td>
<td>7-50%</td>
<td>4A</td>
</tr>
<tr>
<td>Amorphous</td>
<td>13-26%</td>
<td>4B</td>
</tr>
<tr>
<td>Fine pleomorphic</td>
<td>28-40%</td>
<td>4B</td>
</tr>
<tr>
<td>Fine Linear branching</td>
<td>53-80%</td>
<td>4C</td>
</tr>
</tbody>
</table>
How to Categorize Cysts?

High Resolution US should be performed
43 y/o with palpable lump

BIRADS 0
Local tenderness, malaise on questioning

- Thick walled Complicated cyst

- What BIRADS 3 or 4?
  - BIRADS 3
45y/o with lump in the left breast
Simple vs Complicated vs Complex cyst

- Cyst should be judged with the worst features
  - Thick internal septations
  - Mural solid nodules
  - Microlobulated margins
  - Fibrovascular stalk

- 20% of complex cysts are malignant
- BIRADS 4b/4c
- VAB or Surgical excision more appropriate
Scenario 1

Mammography; Incomplete” (BI-RADS® category 0) assessment due to an asymmetry recommending additional US examination

US examination then is performed showing no abnormal findings

Is it appropriate to also assess the US examination as BI-RADS® category 0, recommend additional MRI examination?
**Scenario 1**

If diagnostic mammography is performed concurrently with US, an overall BI-RADS® assessment category should be given:

- BI-RADS® category 1
- BI-RADS® category 2
- BI-RADS® category 3
- BI-RADS® category 4

- BI-RADS® category 0 **should not be used for diagnostic breast imaging findings that warrant further evaluation with MRI**
- Incorporate this recommendation into the patient management recommendations in the combined mammography/US report.
Scenario 2

Axillary adenopathy is seen at screening mammography with no suspicious findings in the breasts.

What should the BI-RADS® final assessment be?
Scenario 2

- In the absence of a known infectious or inflammatory cause, isolated *unilateral* axillary adenopathy should receive a suspicious (BI-RADS® category 4) assessment.

- If a benign cause is elucidated, a benign (BI-RADS® category 2) assessment would be appropriate.

- Bilateral axillary adenopathy would be assessed as benign (BI-RADS® category 2) in some situations and as suspicious (BI-RADS® category 4) in others.
Scenario 3

A woman in her 20s discovered a palpable breast mass. Imaging shows probable fibroadenoma.

*What should the assessment be? Is biopsy always necessary?*
Scenario 3

- Probably benign (BI-RADS category 3)

- Recommend follow up imaging, unless the woman prefers biopsy or even excision if the mass is cyclically painful

- Even if biopsy is done for this category 3 lesion, the probably benign assessment should not change.
Report Structure... Ultrasound

- Indication for examination
- Statement of scope and technique of breast US examination
- Succinct description of the overall breast composition (screening only)
- Clear description of any important findings
- Comparison to previous examination(s), including correlation with physical, mammography, or MRI findings
- Composite report
- Assessment
- Management
Tissue Composition (Screening)

- Homogeneous background echotexture-fat
- Homogeneous background echotexture-fibroglandular
- Heterogeneous background echotexture
Labeling and Measurement

- The longest horizontal dimension followed by the vertical measurement, and the anteroposterior last (ML x SI x AP)
- The longest horizontal dimension followed by the vertical measurement, and the anteroposterior last (ML x SI x AP)
- Clock face location and distance from the nipple.
- Distance from skin and chest wall

- 17x26x12mm (ML x SI x AP)
- 9’0 C, 2cm from the nipple
- 11 mm from skin and 18 mm from chest wall
Correlating Mammography and US

- Correlate the size and location of lesions and match the type and arrangement of tissues surrounding the lesion in order to reduce the likelihood of misregistration.

- Allowance for positional changes should be made going from upright with mammography and prone with MRI to supine or supine-oblique with US.
- If a sonographic finding corresponds to a palpable abnormality, or to a mammographic or MRI finding, this should be stated explicitly in the US report.

- If the US finding is new or has no correlate, this should also be stated in the report.

- In a follow up US, the current report should describe any changes. An increase of 20% or more in the longest dimension of a probably benign solid mass within 6 months may prompt biopsy.

  - An increase of only 1–2 mm in lesion size may be related to differences in scanning technique or patient positioning.
Composite Reports

When more than one type of examination is performed the examinations be reported together with an overall assessment and management recommendations.

The overall assessment (and concordant management recommendations) should reflect the more abnormal of the individual assessments.

Exceptions to this rule occur when the characteristically benign features on one examination supersede the less specific benign features on the other examination. Eg. partially circumscribed, noncalcified mass at mammography, superseded by simple cyst at US.
A woman undergoes breast US examination to evaluate spontaneous bloody nipple discharge, and I see a mass within a duct.

How do I describe this using the BI-RADS® lexicon?
Scenario 4

- Intraductal location
- Size
- Presence of vascularity
- Clock face position
- Distance from the nipple
- Length of the duct segment that contains the mass
Scenario 5

A 32-year-old woman presents with a large, painful breast mass. Her US shows an abscess. Aspiration is performed for culture sensitivity and relief of symptoms.

What assessment and management recommendations should be provided in the breast imaging report?

Benign (category 2) assessment
A management recommendation of aspiration should be made
A circumscribed mass in a 42-year-old woman recorded as right breast, 10 o’clock, 5 cm posterior to the nipple. She returned for a 6-month follow-up US, and the mass was now seen located at 11:00 in the right breast 6 cm posterior to the nipple.

How should lesion location be reported on the follow-up US?
Due to minor differences in both patient positioning and angles of insonation difficult to precisely duplicate the scanning conditions of a previous examination

Ensure that the mass depicted on both examinations is one and the same.

Images labeled either precisely as on the previous examination or as actually located on the current examination.

If the current actual location is used in labeling, and if there is a slight difference the report could state, “The right breast mass seen previously at 10:00 position, 5 cm posterior to the nipple is the same mass seen on today’s exam in the right breast at 11:00 position, 6 cm posterior to the nipple, the minor difference being due to variability in patient positioning.”
Scenario 7

*For bilateral screening US performed with no abnormality identified, what images should I record?*

Record one image in one plane (ordinarily radial) for each quadrant, and record one image of the retroareolar region just behind the nipple.