Breast Imaging: Ultrasound Evaluation of Breast Masses

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I have no disclosures
**Case 1: Additional views of baseline screening mammogram finding**

Assuming this is the only finding at mammography, what is the best BI-RADS assessment and next step?

A. BI-RADS 0 Incomplete, ultrasound for further evaluation
B. BI-RADS 2 Benign, return to annual screening
C. BI-RADS 3 Probably benign, 6 month follow-up recommended
D. BI-RADS 4 Suspicious, biopsy of mass recommended

**Case 1a: Ultrasound of baseline screening mammographic mass**

Assuming these are all the appropriate size and position which are possible correlates to mammographic finding?

A. Only A
B. A, B
C. A, C
D. B, C
Case 1: Isolated benign appearing mass on baseline mammogram

- Single well circumscribed oval mass
- BI-RADS assessment depends partially on clinical scenario
  - If mammographically stable for $\geq$ 2 years $\rightarrow$ BI-RADS 2 (benign)
  - Could also be considered BI-RADS 2 (benign) as part of bilateral benign appearing masses
    - Multiple (at least 3), bilateral, similar appearing, well circumscribed, round and oval shaped masses
  - If new or baseline single finding must be evaluated with US $\rightarrow$ BI-RADS 0

Case 1: Isolated benign appearing mass on baseline mammogram

- Cannot differentiate between cyst or solid by mammogram
  - DDX: simple cyst, complicated cyst or solid mass
- All of these ultrasound images demonstrate benign features (although sometimes still require biopsy)
  - Parallel to skin surface
  - Posterior acoustic enhancement
  - Well circumscribed margins
  - Oval shape
Case 1: Isolated benign appearing mass on baseline mammogram

- Ultrasound image A shows a simple cyst
  - Anechoic
  - Avascular
- Ultrasound image B shows a solid appearing mass
  - Hypoechoic
- Ultrasound image C shows a mass nearly isoechoic to surrounding fat most consistent with a lipoma
  - This could not be the correlate as a fat density mass would be fat density on mammography as well

<table>
<thead>
<tr>
<th>BI-RADS descriptors unique to US</th>
<th>Mass shape: Mammo</th>
<th>Mass shape: US</th>
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<tr>
<td>Orientation</td>
<td><strong>Round</strong></td>
<td><strong>Round</strong></td>
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<td>Parallell</td>
<td><strong>Oval</strong></td>
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<td>Lesion boundary</td>
<td><strong>Irregular</strong></td>
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<td>Enhancement</td>
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<td>Combined</td>
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<tr>
<td>None</td>
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</table>

BOLD = benign
Case 2: Correlate to mass found on screening mammogram (non palpable)

- NEW solid masses should be biopsied
  - Even if benign appearing
  - Should not be followed as BI-RADS 3
- MRI is not indicated as the next step
- If it is unknown if this is new or not, this is appropriate for probably benign follow up (BI-RADS 3)
  - Baseline
  - Incidentally found by US without mammographic correlate

Chose the appropriate BI-RADS and clinical history combination (s):
A. A, B
B. B, C
C. C, D
D. D, E

A. BI-RADS 0 AND prior mammograms, this is a NEW mass → MRI recommended
B. BI-RADS 2 AND no prior mammograms, return to annual screening mammogram
C. BI-RADS 3 AND prior mammogram, NEW but benign appearing mass, 6 month follow-up US
D. BI-RADS 3 AND no prior mammogram, 6 month follow-up US
E. BI-RADS 4 AND prior mammograms, this is a NEW mass → biopsy recommended
Case 2: Correlate to mass found on screening mammogram (non palpable)

- This mass meets criteria to be considered probably benign in the appropriate clinical scenario
  - Oval shape
  - Parallel in orientation
  - Completely well circumscribed
  - Mildly hypoechoic or hyperechoic
  - No suspicious features
    - Posterior acoustic shadowing
    - Non-circumscribed margins
  - Non-palpable*
    - *Controversial and age dependent
  - Not new

Case 3: Screen detected new mammographic mass

Ultrasound is planned as the next step for this finding. You will be shown possible ultrasound correlates on the next slide and be asked to pick the best correlate(s) and next step.
Case 3: Screen detected new mammographic mass

No internal vascularity was present in any of these

Which of the above sonographic findings is/are acceptable correlates to the mammographic mass?

A. A, D
B. B only
C. A, C
D. C only

• Suspicious oval mammographic mass with indistinct, possibly spiculated margins
• Appropriate correlative ultrasound finding cannot be benign
• A, B and D are all benign ultrasound findings
Case 5: New palpable lump

Which of the following is the most appropriate diagnosis and BI-RADS for finding labeled A?
A. Simple cyst, BI-RADS 2
B. Complicated cyst, BI-RADS 2
C. Complex cyst, BI-RADS 4
D. Complex cystic and solid mass, BI-RADS 4

No internal vascularity was present
Fluid debris level
Many of these scattered around

Case 4: Complicated cyst

• This case demonstrates a benign appearing complicated cyst with a fluid debris level, no internal vascularity, posterior acoustic enhancement and no suspicious features
• Can be considered benign
• But must be differentiated from a “complex cystic and solid mass” which is suspicious
  – Complex cyst is the older term and has been removed from the current BI-RADS edition
• Simple cyst is completely anechoic
Case 5: Ultrasound correlate to NEW mammographic mass

In addition to this being oval in shape, anechoic in echogenicity, parallel in orientation with posterior acoustic enhancement, which BI-RADS descriptors and assessment are most accurate for this US finding?

A. Simple cyst with circumscribed margins – BI-RADS 2
B. Solid mass with circumscribed margins – BI-RADS 3
C. Solid mass with indistinct margins – BI-RADS 3
D. Solid mass with indistinct margins – BI-RADS 4

No internal vascularity was present

Case 5: Ultrasound correlate to NEW mammographic mass

A. Simple cyst with circumscribed margins – BI-RADS 2
   – Margins are not circumscribed
B. Solid mass with circumscribed margins – BI-RADS 3
   – New findings cannot be BI-RADS 3
C. Solid mass with indistinct margins – BI-RADS 3
   – Non-circumscribed mass cannot be BI-RADS 3
D. Solid mass with indistinct margins – BI-RADS 4
   – Even one subtle suspicious finding requires biopsy in the setting of other benign features
Case 6: Left nipple discharge

Which of the above diagnoses are appropriate given images?
A. A, B, E
B. C, D
C. C, E
D. All of the above

- This case demonstrates a hypoechoic intraductal mass with internal vascularity
  – Cannot be ectatic duct with or without debris (should not see vascularity)
- Main differential is DCIS and papilloma
  – Papilloma being much more common at biopsy
  – More common cause of nipple discharge

A. Ectatic duct
B. Ectatic duct with debris
C. Ductal carcinoma in situ
D. Lobular carcinoma is situ
E. Papilloma
Case 7: History withheld

Which of the following is the appropriate initial BI-RADS and presumed diagnosis and follow up BI-RADS and presumed diagnosis?
A. BI-RADS 2 Complicated cyst/BI-RADS 2 smaller simple cyst
B. BI-RADS 3 Hematoma/fat necrosis/ BI-RADS 2 same
C. BI-RADS 3 Hematoma/fat necrosis/ BI-RADS 3 same
D. BI-RADS 3 Angiolipoma/BI-RADS 2 smaller angiolipoma

Initial presentation:
no true internal vascularity was present

Case 7: Trauma with visible bruise

- Hematoma/fat necrosis will often appear heterogeneous but predominantly hyperechoic occasionally with centrally anechoic or hypoechoic areas
- While not a typical appearance, invasive carcinoma can be heterogeneous and hyperechoic
  - For this reason, clinical correlation with visible bruise and history of trauma is needed
  - Still, malignancy can hemorrhage and short interval follow up is recommended
    - Usually 1-2 months rather than typical 6 month follow up as this should change quickly
Case 8: 30 year old woman with probably benign mass

Which of the following is the *most likely* diagnosis with appropriate BI-RADS and best next step?

A. Fibroadenoma, probably benign BI-RADS 3 continued surveillance
B. Fibroadenoma, suspicious BI-RADS 4 biopsy recommended
C. Phyllodes tumor, suspicious BI-RADS 4 biopsy recommended
D. Pseudoangiomatous Stromal Hyperplasia, suspicious BI-RADS 4 biopsy recommended

• Increased by 50% in size at first 6 month follow up.
• No other significant history

Case 8: Fibroadenoma

• This appearance would be consist with fibroadenoma, phyllodes, pseudoangiomatous stromal hyperplasia (PASH)
• All of these can grow
• Even with interval growth, fibroadenoma is still by far the most likely

• Increased by 50% in size at first 6 month follow up.
• No other significant history
Case 8: Fibroadenoma

- Fibroadenomas can fluctuate slightly in size
- In a biopsy proven fibroadenoma, up to approximately 20% in 6 months is acceptable
- But in the case of an unsampled probable fibroadenoma, sampling is recommended

- Increased by 50% in size at first 6 month follow up.
- No other significant history

Case 9: 60 year old woman with new palpable lump (mammogram negative)

Which of the following statements is accurate for this case?

A. Hyperechoic masses are almost always benign and this is also likely to be benign, but it is palpable BI-RADS 4A
B. There are no suspicious ultrasound features, BI-RADS 2
C. This is most likely malignant given several associated suspicious features, BI-RADS 5
D. This is most likely a hematoma despite absence of visible bruise or history of trauma, BI-RADS 3
Case 9: Echogenic masses

- This was biopsied as it was newly palpable and had indistinct margins and internal vascularity
  - Pathology: Angiolipoma (benign)
- Initially hyperechoic masses considered benign (100% negative predictive value)
  - Still the majority are benign
- Larger study found 0.5% of malignancies are hyperechoic
- Look for suspicious features

Case 9: Echogenic masses

- DDX of hyperechoic masses at ultrasound (usually benign)
  - Lipoma
  - Hematoma
  - Angiolipoma
  - Fat necrosis
  - Silicone granuloma
  - Pseudoangiomatous Stromal Hyperplasia
  - Galactocele
- Malignant
  - Invasive ductal and lobular carcinoma
  - Lymphoma
  - Metastasis
  - Angiosarcoma
**Case 10: Screen detected area of distortion**

Which of the following would be an acceptable non-malignant concordant pathology result for this case?

A. Apocrine metaplasia  
B. Fibroadenomatous change  
C. Radial scar complex sclerosing lesion  
D. None, this is BI-RADS 5 and should be excised if non-malignant results are obtained

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**Case 10: Radial Scar Complex Sclerosing lesion**

- This lesion has several suspicious features  
  – Posterior acoustic shadowing  
  – Irregular shape  
  – Spiculated margins  
  – Hypoechoic echogenicity  
- Radial scar complex sclerosing lesion remains in the differential and would prompt surgical excision  
- The other primary differential is invasive ductal or lobular carcinoma  
- Fat necrosis could also have a similar appearance
Thank you
Any questions?

References


• Cardenosa, Gilda (2008) Breast Imaging Companion Philadelphia, PA Lippincott Williams & Wilins