Clinical Feasibility of Achieving the Intended Outcome of BI-RADS 5 Assessment at Diagnostic Breast Imaging Evaluation

Abstract 17-110
Authors and Disclosures

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No financial disclosures
Purpose: Understanding BI-RADS 5

• Highly suggestive of malignancy
  • PPV needs to be ≥ 95% per ACR BI-RADS Atlas

• However, no literature to support such a PPV in clinical practice
  • Literature suggests overuse of BI-RADS 5 to include lesions whose likelihood of malignancy is less than 95% [3,4]

• Study aims:
  • Assess PPV of BI-RADS 5 given at diagnostic mammography and/or ultrasound at our institution
  • Identify the specific imaging features needed to reach PPV ≥ 95%
    • Prior reports suggest that multiple suspicious features are needed to reach this threshold [3,6,7]
Materials and Methods

• Retrospective review of 22,564 patients who underwent diagnostic breast imaging evaluation, January 2010-September 2015.

• 238 patients (1.1%) were given BI-RADS 5 assessment (237 women, 1 man)

• Imaging descriptors extracted for each BI-RADS 5 patient:
  • Mass shape and margin
  • Calcifications and distribution
  • Asymmetry
  • Distortion

• Secondary features: Skin thickening/retraction, nipple retraction, lymphadenopathy

• All patients went on to percutaneous biopsy or surgical excisional biopsy (pathology gold standard)
## Results: Demographics of BI-RADS 5 patients

<table>
<thead>
<tr>
<th><em>Age (years)</em></th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 40</td>
<td>20 (8.4)</td>
</tr>
<tr>
<td>40 - 49</td>
<td>43 (18.1)</td>
</tr>
<tr>
<td>50 - 59</td>
<td>60 (25.2)</td>
</tr>
<tr>
<td>60 - 69</td>
<td>50 (21.0)</td>
</tr>
<tr>
<td>70+</td>
<td>65 (27.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breast density</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>36 (15.1)</td>
</tr>
<tr>
<td>B</td>
<td>100 (42.0)</td>
</tr>
<tr>
<td>C</td>
<td>79 (33.2)</td>
</tr>
<tr>
<td>D</td>
<td>12 (5.1)</td>
</tr>
</tbody>
</table>

Total number of patients = 238. 10 patients did not have reported breast density because they did not undergo diagnostic mammogram.

Note: * mean age is 62.5 years; range: 29-96 years; one male patient: 83 years old.
Results: Exam Indications for BI-RADS 5 patients

Figure 1: Distribution of exam indications for diagnostic breast imaging evaluation. Others include nipple retraction (0.8%), breast contour change (0.4%), palpable axillary lymph nodes (1.7%), bone metastasis with unknown primary (0.8%)
## Results: Pathologic Diagnoses

### Table 3. Pathologic Diagnoses of BI-RADS Category 5 Lesions.

<table>
<thead>
<tr>
<th>Pathologic diagnosis</th>
<th>Number of lesions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC only</td>
<td>51 (21.4)</td>
</tr>
<tr>
<td>ILC only</td>
<td>21 (8.8)</td>
</tr>
<tr>
<td>DCIS only</td>
<td>10 (4.2)</td>
</tr>
<tr>
<td>IDC + DCIS</td>
<td>104 (43.7)</td>
</tr>
<tr>
<td>ILC + DCIS</td>
<td>5 (2.1)</td>
</tr>
<tr>
<td>IDC + ILC</td>
<td>8 (3.4)</td>
</tr>
<tr>
<td>IDC + ILC + DCIS</td>
<td>10 (4.2)</td>
</tr>
<tr>
<td>Adenocarcinoma (FNA only)</td>
<td>18 (7.6)</td>
</tr>
<tr>
<td>Benign</td>
<td>5 (2.5)</td>
</tr>
<tr>
<td>Others</td>
<td>6 (2.1)</td>
</tr>
</tbody>
</table>

Notes: IDC = invasive ductal carcinoma; ILC = invasive lobular carcinoma; DCIS = ductal carcinoma in situ; FNA = fine needle aspiration.

1. Benign lesions include: fat necrosis and fibrocystic change (n=1), intra-ductal papilloma with calcifications (n=1), fibromatosis (n=1), and low-grade phyllodes (n=2).

2. Others include: papillary carcinoma (n=2), metastatic breast cancer (n=2), malignant lymphoma (n=1), metaplastic carcinoma and grade II tumor (n=1).

- 233/239 malignant (true positive) = 0.977 PPV (0.952-0.993 95% CI)
Results: Lesion Descriptors

Vast majority of patients (92%) underwent both diagnostic mammography and ultrasound

- Mass as a primary or secondary finding:
  - 170 patients (71.4%)

- Calcifications as a primary or secondary finding:
  - 115 patients (48.3%)
    - Most common morphology: fine pleomorphic (30.5%)
    - Most common distribution: regional (24.4%)

- Architectural distortion as a primary or secondary finding:
  - 46 patients (20.7%)

- Mammographic asymmetry/focal asymmetry/developing asymmetry as a primary or secondary finding:
  - 30 patients (13.5%)
Almost all patients exhibit 4 or more suspicious descriptors when undergoing both diagnostic MG/US.

Figure 3: Number of suspicious descriptors for BI-RADS 5 patients who underwent both diagnostic mammography and ultrasound (n=219)
Most patients who only underwent diagnostic US still exhibit 3-4 suspicious descriptors

2 descriptors (7%, n=1)

3 descriptors (40%, n=6)

4 or more descriptors (53%, n=8)

Figure 4: Number of suspicious descriptors for BI-RADS 5 patients who underwent diagnostic ultrasound only (n=15)
Patients undergoing only diagnostic MG exhibit at least 2 suspicious descriptors

Figure 5: Number of suspicious descriptors for BI-RADS 5 patients who underwent diagnostic mammogram only (n=4)
Conclusions

• PPV of BI-RADS 5 lesions in our study was 97.9%, which meets the ACR guidance of PPV ≥ 95% (95% CI = 95.2-99.3%)

• BI-RADS 5 rarely used, only accounting for 1.1% of overall diagnostic imaging evaluations (place exact numbers)

• Most common presenting symptom was a palpable mass, as expected (73%)
  • Bloody nipple discharge only 1.3%, lower than previously reported rates of 3-12% [9,10]
  • Fewer than 5% reported skin thickening, lymphadenopathy, nipple retraction
Conclusions

• Overall, majority of patients had 4 or more suspicious imaging descriptors, which is recommended to justify BI-RADS 5 assessment
  
  • 95% with 4 or more descriptors (225/238)
  • 4% with 3 descriptors (9/238)
  • <2% with 2 descriptors (4/238, imaged with single modality)
Study Limitations

• Retrospective study design can introduce retrospective bias
  • Descriptors were extracted from available radiology reports, and not all useful descriptors may have been reported in the data set
• Radiologists with varying levels of experience (1-30+ years)
  • However, all had fellowship training in breast imaging
• Given study design, inter- and intra-reader variation could not be addressed
References


THANK YOU!
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