Risk of Malignancy in Solid Breast Masses Considered Probably Benign or Low Suspicion

Abstract: **Background:** To determine whether solid breast masses with benign sonographic features have less than 2% incidence of malignancy, allowing management by follow up instead of biopsy. **Patients and Methods:** Sonography reports of solid breast masses from February 2021 to the end of February 2022 in Al-Yarmouk teaching hospital, prospectively classified as probably benign (BIRAD III) or low suspicion (BIRAD IVa) were reviewed. The BIRADS categories were correlated with outcome data and tissue diagnosis. **Results:** The study population included 136 lesions in 100 patients (mean age 36.78 years, range 11-79 years). A total of 63 lesions were prospectively classified as BIRAD III and 73 lesions as BIRAD IVa. A total of 133 lesions were proved as benign lesions and only 3 lesions were malignant. All 3 malignancies seen in women older than 50 years. **Conclusions:** The incidence of malignancy in solid breast lesions classified as BIRAD III was 1.5% and in BIRAD IVa was 2.7%. Palpability alone does not considered as features to rise up the BIRAD grade of any breast lesions.

**Keywords:** Breast masses; sonography; BIRAD lexicon.

**INTRODUCTION**

**Overview:**
The 'probably benign' (category 3) assessment in the (BI-RADS) Breast Imaging Reporting and Data Systems is assigned to lesions with specific imaging findings. These include a solid mass with an oval shape, parallel orientation, well circumscribed margin, homogenous texture and no suspicious malignant characteristics. While these masses have benign imaging features, there is still a low (< 2%) risk for malignancy (Le-Petross, H. T. *et al.*, 2011). Breast cancer is the second leading cause of cancer deaths in women (after lung cancer) and the most common cancer in women. The incidence of breast increases dramatically with age. Although most breast cancers occur in women older than 50 years, 31% of women diagnosed with breast cancer between 1996 and 2000 were younger than 50 years. The rate of increase is greatest in women younger than 50 years but most cases (approximately 80% of invasive cases) occur after age 50 years. Breast cancer commonly affects female older than 40 years; however, younger female can also be affected, especially those with a genetic predisposition (Pilgrim, C. *et al.*, 1993).

Risk factors for female breast cancer include (Yoo, J. L. *et al.*, 2010):
- increasing age
- reproductive lifestyle
  - early menarche and late menopause
  - nulliparity, infertility, or, if parous, few children with late age at first delivery
  - lack of breast feeding
  - unopposed estrogen hormone replacement therapy
- personal history of breast cancer or a high risk breast lesion
- first degree relative history with breast cancer
- genetic mutations
- thoracic radiation therapy
- alcohol consumption
Radiological Anatomy of the Breast (Kumar, B. A. et al., 2017):

The radiological examination may show the following anatomical structures:

- Skin
- Nipple and areola
- Fatty tissue
- Breast proper, or corpus mammae
- Blood vessels

Skin:

The skin appears as a thin continuous, radiopaque rim, homogeneous in texture, approximately 1 mm in thickness and readily visible against the radiolucency of the underlying subcutaneous fatty tissue. If the breast is very dense, because of the higher density of the underlying parenchymal structure, however, the skin may occasionally not appear clearly even on a correctly mammogram exposure.

Nipple and Areola:

The skin surrounding the nipple - the areola – is measure up to 3-5 mm in thickness, with a central opacity, cylindrical in shape and of variable size and density, corresponding to the nipple. The retroareolar region, it is a generally triangular posteriorly located, heterogeneous area, which is of particular interest on account of the difficulty of detecting any focal abnormalities, that may be there. In normal conditions the lactiferous ducts are not seen. If they are enlarged they resemble ribbon-like opacities of varying thickness, running in parallel lines.

Fatty Tissue:

Varying amounts of fatty tissue may be present, forming anything from a thin subcutaneous layer to “islets” of various sizes that may occupy the whole breast, depending on the age of the individual female. The breast parenchymal is surrounded by fatty tissue which constitutes anteriorly the premammary fat and posteriorly the retromammary fat anteriorly, subcutaneous fat appears as a radiolucent layer of variable thickness, traversed by planar sheets of fibrous tissue, the Islets of Duret, which accommodate Cooper's ligaments.

The superficial extensions of Cooper's ligaments come to peaks attached to the skin, which anchor the body of the breast to the subcutaneous tissue, known as reticula cutis. Posteriorly, adipose tissue outlines the retromammary space (the bursa of Chassaignac) which separates the breast tissue from the pectoralis major muscle.

Breast Tissue Proper or Corpus Mammae:

The body of the mammary gland is roughly cone-shaped, with the floor resting on the chest wall and its tip projecting towards the nipple. The shape and density of breast parenchyma vary from individual to individual, and are influenced by specific sensitivity to hormonal stimuli, which affect the relation between the various breast tissue components and hence the morphology of the breast.

Blood Vessels:

Vessels are more readily visible in fatty breasts, and appear as thin ribbon-like opacities that may be more or less tortuous; vessel walls may be calcified, in which case they have typical “railway-line” images. In the early stages of calcification, only scattered elongated “casts” are seen, in a linear pattern, reflecting partial calcification of the vascular wall.

The detection and identification of elementary mammographic signs form the basis for correctly breast pathologies interpretation and describing them in the mammographic report accurately. The specific features are the basis for classifying the lesions as benign or malignant. These features define the positive predictive value i.e., the odds that a mammographic sign is associated with or actually shows a cancerous lesion (Kumar, B. A. et al., 2017).

![Gross anatomy of the breast in lateral oblique mammogram (Idris, O. A. M. A. 2017)](image-url)
Ultrasonography (Kumar, B. A. et al., 2017):

It is used to exam mammographic or palpable masses cystic or solid. To evaluate palpable mass in young (under age of 30 years), pregnant and lactating patients, also to evaluate nonpalpable abnormalities for which the mammographic diagnosis uncertain, to exclude a mass in an area of mammographic asymmetric density, to confirm or better visualize a lesion seen incompletely or only one mammographic projection (e.g., near the chest wall) and also used to guide interventional procedures such as cyst aspiration, fine needle aspiration biopsy, and presurgical location.

These uses for breast sonography are also applicable to the postsurgical patient and male breast. Sonography is not used for screening the dense breast (Kolb, T. M. et al., 2002). The main restrictions of US are the inability to detect the microlcalfications representing ductal carcinoma in situ and the fact that it is operator-dependent.

Doppler Evaluation of Breast Vasculature (Stavros, A. T. 2004):

Superficial mammary veins are sometimes visible sonographically as anechoic tubular structures coursing roughly parallel to the skin. Visible vein may be important to distinguish from a
Ultrasound Evaluation of Breast Mass:
The following descriptors should be included in ultrasound study of breast mass (Deng, F. (n.d.)):

**Table (1): Descriptive features of breast mass in ultrasound**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margin</td>
<td>Circumscribed, not circumscribed (angular, microlobulated, indistinct, spiculated)</td>
</tr>
<tr>
<td>Orientation</td>
<td>Parallel, non-parallel (taller than wider, vertical, round)</td>
</tr>
<tr>
<td>Echo pattern</td>
<td>Anechoic, hypoechoic, hyperechoic, heterogeneous, complex cystic and solid</td>
</tr>
<tr>
<td>Posterior features</td>
<td>No posterior features, enhancement, shadowing, combined pattern, calcifications in a mass, architectural distortion</td>
</tr>
<tr>
<td>Associated features</td>
<td>Ductal changes, skin changes (thickening, retraction), edema, absent</td>
</tr>
<tr>
<td>Vascularity</td>
<td>Internal vascularity, vessel in rim, soft</td>
</tr>
<tr>
<td>Elasticity assessment</td>
<td>Intermediate, hard</td>
</tr>
</tbody>
</table>

Breast Imaging Interpretations is done by Breast Imaging-Reporting and Data System (BI-RADS) which includes:

- **BI-RADS 0**: Incomplete (D’Orsi, C. J. et al., (n.d.))
  - Need additional imaging evaluation
  - No risk of malignancy
  - Management: recall for additional imaging

- **BI-RADS 1**: Negative
  - There is nothing to comment on
  - Symmetrical and no masses, architectural distortion, or suspicious calcifications
  - 0% probability of malignancy
  - Management: routine screening

- **BI-RADS 2**: Benign
  - 0% probability of malignancy
  - This category includes:
    - Agree in a group practice on whether and when to describe benign findings in a report
    - Use in screening or in diagnostic imaging when a benign finding is present
    - Use in the presence of bilateral lymphadenopathy, probably reactive or infectious in origin
    - Use in diagnostic imaging and recommend management if appropriate,
      - as in abscess or hematoma
      - as in implant rupture and other foreign bodies
Management: routine screening

**BI-RADS 3:** Probably benign (Messinger, J. *et al.*, 2019)
- <2% probability of malignancy
- Lesions appropriately placed in this category include:
  - Isolated complicated cyst (The Radiology Assistant: Bi-RADS for Mammography and Ultrasound 2013).
  - Hypoechoic mass, circumscribed, oval, parallel, without posterior features or with minimal posterior enhancement
  - Echogenic mass with central anechoic components and surrounding edema consistent with, but not diagnostic of, fat necrosis
  - Distal shadowing without an associated mass
  - Architectural distortion due to postsurgical scar
  - Follow-up at 6, 12 and 24 months showed no change and the final assessment was changed into a Category 2. If patient or referring clinician still prefers biopsy. Then add sentence: Instead of follow-up tissue diagnosis will be performed, due to patient or referring clinician concern (The Radiology Assistant: Bi-RADS for Mammography and Ultrasound 2013).
- BI-RADS 3 is perhaps the most difficult of the assessment categories for the breast imager to properly use, BI-RADS 3 creates a wide variety of actions and reactions. It causes patient anxiety, eliminates some unneeded biopsies, and is often ignored by patients and referring clinicians (Lee, K. A. *et al.*, 2018).
- BI-RADS 3 should only be used after a full diagnostic workup (Lee, K. A. *et al.*, 2018).

**BI-RADS 4:** Suspicious for malignancy (D’Orsi, C. J. *et al.*, n.d.)
- 2-94% probability of malignancy
- For mammography and ultrasound, these can be further divided
- BI-RADS 4A: low suspicion for malignancy (2-9%), it used for
  - Partially circumscribed mass, suggestive of (atypical) fibroadenoma
  - Palpable, solitary, complex cystic and solid cyst
  - Probable abscess
- BI-RADS 4B: moderate suspicion for malignancy (10-49%)
  - Group amorphous or fine pleomorphic calcifications
  - Nondescript solid mass with indistinct margins
- BI-RADS 4C: high suspicion for malignancy (50-94%)
  - New group of fine linear calcifications
  - New indistinct, irregular solitary mass
  - Biopsy should be considered
- BI-RADS 5: Highly suggestive of malignancy
  - >95% probability of malignancy
  - Lesions include in this category are:
    - Spiculated, irregular high density mass.
    - Segmental or linear arrangement of fine linear calcifications.
    - Irregular spiculated mass with associated pleomorphic calcifications.
    - Appropriate action should be taken
- BI-RADS 6: Known biopsy-proven malignancy
  - Use after incomplete excision
  - Use after monitoring response to neoadjuvant chemotherapy

Breast lesions classified as probably benign or low suspicious by ultrasound:

1. **The Classic Fibroadenoma:**
   - Displays the following sonographic findings (Stavros, A. T. 2004):
     - Elliptical or gently lobulated shape (just two or three lobulation)
     - Larger in the transverse and craniocaudal dimensions than in the anteroposterior (AP) dimension (wider-than tall orientation)
     - Isoechoic or mildly hypoechoic echotexture with respect to fat
     - Encompassed completely by a thin echogenic capsule
     - Sound transmission that is either normal or increased in comparison to the transmission of the surrounding tissues
     - Thin edge shadows
     - Mobile during palpation, not fixed to surrounding tissues
     - Slightly compressible
In Color Doppler Imaging of Fibroadenoma:

Blood flow was demonstrated in 83% of fibroadenomas, as three vessel types: feeding vessels 50%, which are prominent vessels leading from the surrounding breast tissue into the fibroadenoma; capsular vessels 96%, which are located within the tissue capsule; and segmental vessels 100%, which are located within the fibrous septa of the fibroadenoma. However, there was no correlation between numbers of vessels counted on sonograms and on histopathological specimens (Strano, S. et al., 2004).

Figure (7): Color Doppler of typical fibroadenoma (Margulis, A. R. & C. A. G. 1986)

As fibroadenomas enlarge, they are more likely to develop more than three lobulations or microlobulations, features that currently still require BIRADS IV a classification.

Figure (8): atypical fibroadenoma (more than three lobulation or with microlobulations) BIRAD Iva (Stavros, A. T. 2004)

Spiculation of Fibroadenomas is Extremely Rare:

Small percentage of fibroadenomas develop angular margins because of previous infarction and adherence to surrounding tissues, because of intense hyalinization, or because the lesion is a complex fibroadenoma with exuberant sclerosing adenosis affecting its margins (Stavros, A. T. 2004).

Figure (9): Fibroadenoma with angular margin (Stavros, A. T. 2004)

Fibroadenoma Variants (Complex Fibroadenomas):

Specific sonographic findings that are present in complex fibroadenomas absolutely exclude the lesion from being classified as probably benign and classified as BIRAD IVa, these changes are include :Cyst formation and epithelial calcifications that seen as small, punctate echogenicity usually too small to cause acoustic shadowing, automatically exclude a solid
nodule from classification as benign. Additionally, the presence of sclerosing adenosis within a complex fibroadenoma (typically occurring in the periphery of the nodule) often results in angular margins and excludes such a nodule from benign classification. Other sonographic findings within solid nodules, however, that may suggest the presence of a complex fibroadenoma without excluding the nodule from benign classification; these include heterogeneous internal texture, internal cysts, and internal foci of hyperechogenicity (Stavros, A. T. 2004).

Figure (10): Punctate echoes within this fibroadenoma represent epithelial calcifications that place it in the category of complex fibroadenomas (Stavros, A. T. 2004)

Figure (11): The large focus of hyper echogenicity within this complex fibroadenoma represents an area of sclerosing adenosis (Stavros, A. T. 2004)

2. **Pseudoangiomatous Stromal Hyperplasia (PASH):**
**Sonographic Findings Include:**
In most of cases appear as well circumscribed nodule and oval and is encompassed in a thin, echogenic pseudocapsule, giving it characteristics that are essentially indistinguishable from a fibroadenoma, classified as BIRAD III lesion. Similar to complex fibroadenomas, some PASH nodules contain cysts or appear as ill-defined lesion, with angular margin or microlobulations that excluded them form BIRAD III and should classified as BIRAD IVa and require biopsy (Stavros, A. T. 2004).

Figure (12): Typical feature of PASH (Rafeek, N. et al., 2017)

3. **Phyllodes Tumor (Cystosarcoma phyllodes):**
Phyllodes tumor is a rare fibroepithelial tumor, it is typically a large, fast growing mass that forms from the periductal stroma of the breast (Gaillard, F. (n.d.)). In ultrasound, an inhomogeneous, solid-appearing mass is the most common manifestation. A solid mass
containing single or multiple, round or cleft like cystic spaces and demonstrating posterior acoustic enhancement strongly suggests the diagnosis of phyllodes tumor. Vascularization is usually present in the solid components (Chao, T. C. et al., 2002). It is often difficult to differentiate phyllodes tumors from fibroadenomas on sonography or mammography, and it is not possible to distinguish between benign and malignant phyllodes tumors on the basis of sonographic or mammographic finding (Lifshitz, O. H. et al., 2003).

4. **Complicated Breast Cyst:**
   They should be carefully differentiated from a complex cyst and may require alternative management, ultrasound appearance include:
   - thin wall with or without posterior acoustic enhancement (Athanasiou, A. et al., 2014)
   - homogenous hypoechoic content (Athanasiou, A. et al., 2014)
   - low-level internal echoes which may change the shape with the patient position (Doshi, D. J. et al., 2007)
   - sloping fluid-fluid levels (Doshi, D. J. et al., 2007)

   By applying power Doppler and demonstration the absence of internal vascularity can prove the absence of solid mass lesion.

   ![Figure (13): Complicated breast cyst (Daly, C. P. et al., 2008)](image)

5. **Post-surgical Breast Scar:**
   It can be a strong and potentially very confusing mimicker of breast malignancy (Weerakkody, Y. (n.d.))

   ![Figure (14): Postsurgical breast scar (Athanasiou, A. et al., 2014)](image)

6. **Galactocele:**
   It is uncommon cause of breast masses, have various sonographic findings, Sonographic characteristics as follows (Stevens, K. et al., 1997):
   - cystic/multicystic: ~50%
   - mixed (cystic + solid): ~37%
   - solid: ~13%

   The presence of a galactocele is, however, confirmed by the aspiration of altered milk products and consequent resolution of the palpable lump (Stevens, K. et al., 1997).

   ![fat fluid level is seen](image)
To distinguish galactoceles from true solid lesions is by using color Doppler. Galactoceles have no internal blood flow, but flow may be demonstrable in the hyperemic outer wall and in the surrounding breast tissue. Septated galactoceles may also have blood
vessels within the thin, echogenic internal septations, the presence of vascularity within an echogenic mass, therefore, indicates that the mass is solid (Stavros, A. T. 2004).

![Figure (19): Color Doppler of galactocoele (Deng, F. (n.d.))](image)

7. **Abscess:**
Sonographic appearance of breast abscess vary according to the pathophysiological stages of abscess, Abscesses that are not adequately treated with surgery, percutaneous drainage procedures, or antibiotics may become chronic and may develop a solid appearance that is difficult to distinguish from other worrisome solid nodules. Such lesions may require biopsy for definitive diagnosis (Stavros, A. T. 2004).

![Figure (20) Chronic abscesses (Daly, C. P. et al., 2008)](image)

- **Core Biopsy (14 Gauge) of the Breast:**
  It has become widely used in open or excisional biopsy. This can be performed by ultrasound guidance or by mammography (stereo tactic guidance). Core biopsy using 11 gauge vacuum-assisted biopsy device has largely supplanted 14-gauge spring-loaded needles for stereo tactic-guided biopsies. Because these devices allow larger samples, there is less underestimation of disease. These are increasingly used for ultrasound-guided biopsies as well (Margulis, A. R. & C. A. G. 1986).

- **OBJECTIVE:**
  - **The Aim of Study:**
    1. Discrimination between BIRAD III and IVA breast lesions
    2. For further characterization of circumscribed masses
    3. To prevent unnecessary short term interval to decrease patient anxiety
    4. Reduces the number of unnecessary benign biopsies while allowing the breast imager to maintain a high sensitivity for the detection of early stage breast cancer.

- **PATIENTS AND METHOD:**
  - **Study Sample:**
    This cross sectional analytic of 140 patients who consulting breast clinic for routine checking or follow up of previously diagnosed breast pathology, examination is done by breast ultrasound and referred for true cut biopsy, adult patients range (11-79 years), mean age was (36.78) years, this study is conducted in breast clinic at AL-Yarmouk teaching hospital in Baghdad
  - **Study Setting:**
    The study was conducted over about one year from February 2021 to the end of February 2022.
  - **Inclusion Criteria:**
Patients with breast lesion classified by the physician & conventional imaging (Ultrasound and/or mammography) as according to the criteria of the breast clinic at the Yarmouk teaching hospital.

- **Exclusion Criteria:**
  1. Female with lesion of malignant ultrasound criteria
  2. Patient refused biopsy
  3. Women without breast abnormality

- **Data Collection:**
  Relevant clinical history (age, presenting complain, menstrual history, previous breast surgery, marital status, family history of CA breast and previous mammogram investigations clinical or self-examinations), then breast examination is done. The histopathological results for the lesion were obtained later (87 true cut biopsy and 49 were excisional biopsy).

- **Ultrasound Examination:**
  Using hospitalized ultrasound equipment type Philips HD11 XE made with 7.5 MHz linear array probe was used. The patient is examined in the sitting position, supine and supine oblique with the ipsilateral arm on the examined side lifted on the head so as to spread the breast. Various scanning methods have been proposed, for diagnostic imaging e.g. systemic scanning in the radial and anti-radial planes were performed.

  Using electronic printer, photocopies were obtained for each breast lesion, this was done on a sensitive paper – roll films.

- **Tru-cut Biopsy (TCB):**
  TCB was performed by specialist radiologist by using (BARD MAX-CORE) disposable core biopsy instrument of 14-18 gauge with needle length of 10-20 cm with penetration depth of 22 mm. The procedure is done under complete aseptic technique. After ultrasound localization of breast lesion, 2% lignocaine-infiltrating anesthetic was administered and a skin incision was performed. A biopsy specimen was obtained by means of 4 successive insertions with different angulations of the needle into the lesion’s core. After immediate immersion of the specimen in a fixative, its quantity and quality were judged and it was sent to the histopathology department. The histopathological reports of the TCB specimens were compared with ultrasound finding and labeled as malignant or benign lesion.

  ![Image](image.png)

  **Figure (21): Core biopsy instrument**

- **The Ethical Considerations:**
  The Study was deal with the patients who was already send to the Ultrasound and mammography. No patient identification or individual patient details was published, and all specific information relating to patient’s identities was protected in the same way.

- **Image Analysis:**
  Ultrasound imaging analysis was performed by specialist radiologist in breast imaging. The morphologic features and size of each lesion were analyzed.

  Regarding the morphologic analysis. About 40 patients were excluded from our study because showing features not fit to category either III or IVA. Finally from 140 patients only 100 patients were included in our study with a total of 136 lesions, histopathological diagnosis was done for all of them considering it as a gold standards for the study.

- **Statistical Analysis:**
  The data analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean, standard deviation and ranges. Categorical data presented by frequencies and percentages. Chi square test was used to assess the association between
histopathological diagnosis and certain information, while Fisher exact test was used instead when the expected frequency was less than 5. A level of P-value less than 0.05 was considered significant.

**RESULTS:**
The total number of study patients was 100 with 136 lesions. All of them were diagnosed with breast lesions classified as BIRAD III or IVA and evaluated by ultrasound superadd by histopathological diagnosis.

**General Characteristics:**
The distribution of study patients by general characteristics is shown in figure and table (3.1). Study patients’ age was ranging from 11 – 79 years with a mean of 36.78 years and a standard deviation (SD) of ± 13.4 years. The highest proportion of study patients was aged between 30 – 49 years (53%).

We noticed that 67% of study patients were married; 80.6% of them were multigravida and 9% were lactating. Family history was positive in 21% of study patients and 31% were using OCP.

**Ultrasound Examination:**
In table 3, we described the lesions by ultrasound and reported that the shape of mass was oval in 64.7% of them; and 88.2% of them were parallel in orientation.

The margin was non-circumscribed in 52.9% of masses, the echo pattern was hypoechoic in 63.2% of them, posterior acoustic enhancement was detected in 59.6% of masses, 15% of masses showed calcification, and vascularity was absent in more than half of masses (51.5%).

Regarding BIRAD, it was IVA in 53.7% of lesions.
Table 3: Characteristics of lesion by ultrasound

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (n= 136)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side of involved breast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>70</td>
<td>51.5</td>
</tr>
<tr>
<td>Left</td>
<td>38</td>
<td>27.9</td>
</tr>
<tr>
<td>Bilateral</td>
<td>28</td>
<td>20.6</td>
</tr>
<tr>
<td>Mass Shape</td>
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<td></td>
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<tr>
<td>Oval</td>
<td>88</td>
<td>64.7</td>
</tr>
<tr>
<td>Round</td>
<td>40</td>
<td>29.4</td>
</tr>
<tr>
<td>Irregular</td>
<td>8</td>
<td>5.9</td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel</td>
<td>120</td>
<td>88.2</td>
</tr>
<tr>
<td>Vertical</td>
<td>16</td>
<td>11.8</td>
</tr>
<tr>
<td>Margin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumscribed</td>
<td>64</td>
<td>47.1</td>
</tr>
<tr>
<td>Non-circumscribed</td>
<td>72</td>
<td>52.9</td>
</tr>
<tr>
<td>Echo Pattern</td>
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<td></td>
</tr>
<tr>
<td>Hypoechoic</td>
<td>86</td>
<td>63.2</td>
</tr>
<tr>
<td>Hyperechoic</td>
<td>25</td>
<td>18.4</td>
</tr>
<tr>
<td>Isoechoic</td>
<td>19</td>
<td>14.0</td>
</tr>
<tr>
<td>Complex cystic and solid</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Heterogeneous</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Posterior Acoustic shadowing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>7.4</td>
</tr>
<tr>
<td>Posterior acoustic enhancement</td>
<td>81</td>
<td>59.6</td>
</tr>
<tr>
<td>Posterior shadowing</td>
<td>40</td>
<td>29.4</td>
</tr>
<tr>
<td>Combined pattern</td>
<td>5</td>
<td>3.7</td>
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<tr>
<td>Associated features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcification</td>
<td>15</td>
<td>11.0</td>
</tr>
<tr>
<td>Ductal changes</td>
<td>7</td>
<td>5.1</td>
</tr>
<tr>
<td>Skin thickening</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Edema</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Vascularity in color Doppler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>70</td>
<td>51.5</td>
</tr>
<tr>
<td>Internal vascularity</td>
<td>23</td>
<td>16.9</td>
</tr>
<tr>
<td>Vessel in rim</td>
<td>43</td>
<td>31.6</td>
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<tr>
<td>BIRAD</td>
<td></td>
<td></td>
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<tr>
<td>III</td>
<td>63</td>
<td>46.3</td>
</tr>
<tr>
<td>IVA</td>
<td>73</td>
<td>53.7</td>
</tr>
</tbody>
</table>

**Histopathological Results:**
Figure 23 and table (4) shows the results of histopathological examination. We noticed that malignancy was reported in three lesions (2.2%); two of them were invasive DC; while 133 lesions were benign; 88.7% of them were fibroadenoma.
Table 4: Histopathological Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (n= 136)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant Lesion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invasive ductal carcinoma</td>
<td>2</td>
<td>66.6</td>
</tr>
<tr>
<td>Invasive papillary carcinoma</td>
<td>1</td>
<td>33.3</td>
</tr>
<tr>
<td>Benign Lesion</td>
<td>n= 133</td>
<td></td>
</tr>
<tr>
<td>Fibro adenoma</td>
<td>118</td>
<td>88.7</td>
</tr>
<tr>
<td>Intraductal papilloma</td>
<td>6</td>
<td>4.5</td>
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<tr>
<td>Complex cyst</td>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>Complicated cyst</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Abscess</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Benign Phylloides tumor</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>PASH</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Galactocele</td>
<td>1</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Table 5 shows the association between histopathological results and certain characteristics. We noticed that all patients with malignant lesions were aged ≥ 50 years with a significant association (P= 0.001) between histopathological results and age.

No statistical significant associations (P ≥ 0.05) between histopathological results and all other characteristics.

Table 5: Association between histopathological results and certain characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Histopathological Result</th>
<th>Total (%)</th>
<th>P- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Malignant (%)</td>
<td>Benign (%)</td>
<td>n= 136</td>
</tr>
<tr>
<td>Age (Year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>0 (0)</td>
<td>37 (100.0)</td>
<td>37 (27.2)</td>
</tr>
<tr>
<td>30 – 49</td>
<td>0 (0)</td>
<td>83 (100.0)</td>
<td>83 (61.0)</td>
</tr>
<tr>
<td>≥ 50</td>
<td>3 (18.8)</td>
<td>13 (81.2)</td>
<td>16 (11.8)</td>
</tr>
<tr>
<td>Family History</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>2 (7.4)</td>
<td>26 (92.8)</td>
<td>28 (20.6)</td>
</tr>
<tr>
<td>Negative</td>
<td>1 (0.9)</td>
<td>107 (99.0)</td>
<td>108 (79.4)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>1 (0.9)</td>
<td>110 (99.0)</td>
<td>111 (81.6)</td>
</tr>
<tr>
<td>Single</td>
<td>2 (8.0)</td>
<td>23 (92.0)</td>
<td>25 (18.4)</td>
</tr>
<tr>
<td>Lactating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0 (0)</td>
<td>13 (100.0)</td>
<td>13 (9.6)</td>
</tr>
<tr>
<td>No</td>
<td>3 (2.4)</td>
<td>120 (97.6)</td>
<td>123 (90.4)</td>
</tr>
<tr>
<td>OCP Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 (2.3)</td>
<td>43 (97.7)</td>
<td>44 (32.4)</td>
</tr>
<tr>
<td>No</td>
<td>2 (2.2)</td>
<td>90 (97.8)</td>
<td>92 (67.6)</td>
</tr>
<tr>
<td>Size of lesion on US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 20 mm</td>
<td>0 (0)</td>
<td>30 (100.0)</td>
<td>30 (22.1)</td>
</tr>
<tr>
<td>Equal to and more than 20 mm</td>
<td>3 (2.8)</td>
<td>103 (97.2)</td>
<td>106 (77.9)</td>
</tr>
<tr>
<td>Palpability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Palpable</td>
<td>1 (1.0)</td>
<td>95 (99.0)</td>
<td>96 (70.6)</td>
</tr>
<tr>
<td>palpable</td>
<td>2 (5.0)</td>
<td>38 (95.0)</td>
<td>40 (29.4)</td>
</tr>
</tbody>
</table>

Sensitivity, Specificity and Accuracy of Ultrasound:

In this study, we evaluated BIRAD of ultrasound in detection of highly suspicious malignant lesions as shown in table (6).

The sensitivity of ultrasound was = 66.7%, specificity = 46.6% and accuracy = 47.1%. +ve predictive value was 2.7%, while –ve predictive value was 98.4%.

Table 6: Comparison between BIRAD ultrasound classifications of breast lesions with histopathological finding in detection of highly suspicious malignant lesions

<table>
<thead>
<tr>
<th>BIRAD by ultrasound</th>
<th>Histopathological Finding</th>
<th>Malignant</th>
<th>Benign</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspicious (IVA)</td>
<td>2</td>
<td>71</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Not (III)</td>
<td>1</td>
<td>62</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>133</td>
<td>136</td>
<td></td>
</tr>
</tbody>
</table>
Cases from our Study:

Case 1:

Figure (24): 42 years old unmarried female patient, presented with RT side breast pain, no previous family history of breast diseases.

Ultrasound findings: well circumscribed oval shaped, hypoechoic right breast mass, measured 2.9x2 cm seen in 5th o’clock, avascular in color Doppler…picture suggesting of fibroadenoma (BIRAD III)

Histopathological result was fibroadenoma

Case 2:

Figure (25): 44 years old female patient, presented with left palpable breast mass.

Ultrasound findings: well circumscribed lobulated left breast mass heterogenous in texture with multiple cystic lesions, measured 22x18 mm, seen at 2nd o’clock. Pictrue suggesting complex fibroadenoma (BIRAD IVa).

Histopathological results was Pseudoangiomatous stromal hyperplasia
Case 3:

Figure (26): 52 years old female patient, presented with right breast pain and palpable mass.

Ultrasound findings: well circumscribed, lobulated right breast mass, heterogeneous in texture, measured 24x14 mm, showing internal vascularity in color Doppler. Picture suggesting complex fibroadenoma (BIRAD IVa)

Histopathological results was papillary carcinoma

Case 4:

Figure (27): 40 years old female patient, presented with right breast palpable mass.

Ultrasound findings: well circumscribed lobulated cystic lesion with internal septations and echogenic debris at retroareolar region, measured 28x12 mm, absent internal vascularity in color Doppler. Picture suggesting of galactocele.

Histopathological results was galactocele.

DISCUSSION:

A breast mass is a common complaint in the surgical outpatient department in major hospitals, with anxiety of being possible malignancy is extremely common. Accurate diagnosis of cancer has been a diagnostic dilemma since long. It is extremely important that unnecessary surgeries or invasive treatment for benign lesions are minimized (https://www.semanticscholar.org). Ultrasound is one of the most commonly used modalities for breast imaging. As a convenient and cost effective diagnostic methods, ultrasound has played an essential role in diagnosis and evaluation of breast lesions in many countries. However, despite the promotion of the BIRAD lexicon, operator dependence and interobserver variability remain the major restrictions of ultrasound (Zhao, C. et al., 2020). Lesion features include mass shape, orientation, margins, matrix echogenicity and attenuation. In addition, in addition to the associated
findings such as calcification, ductal changes and changes in the skin and edema, all these features should be described and applied in a consistent fashion. These features of masses have been mentioned previously (Mendelson, E. B. et al., 2001). In our study patients’ age ranged from 11 to 79 years with mean of 36.78 years, ±13.4 SD, while in (Giess, C. S. et al., 2012) the age was ranged from 15 to 68 years with mean of age 31.0 years. While in (Moon, H. J. et al., 2010) age ranged from 15 to 78 years with mean of age 44.5 years. By decade in our study 37 lesions seen in patients younger than 30 years; 83 lesions seen in patients 30 to 49 years old; 13 lesions seen in patients 50 years and older while in (Giess, C. S. et al., 2012) 229 lesions seen in patient younger than 30 years; 190 lesions seen in patients 30-49 years old, 21 lesions seen in patients 50 years and older. In our study 22.1% of lesions were smaller than 20 mm, and 77.9 % of lesions were equal to or larger than 20 mm in their maximal dimension. Regarding side of involved breast in our study we found that 51.5% of total lesions seen at right breast (most commonly involved side), 27.9% of total lesions seen at LT breast while 20.6% of total lesions seen bilaterally that goes with (Kanase, V. V. et al., 2015) most of lesions seen in right breast (54%), followed by 46% of lesions seen in left side and (0%) no lesions seen bilaterally. Regarding palpability we found that (96 lesions) 70.6 % were nonpalpable and (40 lesions) 29.4% were palpable. Association between palpability of lesions and histopathological results in our study found (P= 0.125) statistically not significant association that goes with (Shin, J. H. et al., 2009) that report no statistical difference in malignancy rate between palpable and nonpalpable lesions. A total of 63 lesions were classified as BIRAD III (probably benign) and only 1 (1.5%) of them proved malignant that goes with (Sickles, E. A. 1991) that show risk of malignancy in BIRAD III lesion is < 2%. while total of 73 lesions in our study were classified as BIRAD IVa (low suspicious) and 2 of them (2.7%) proved malignant in Histopathological studies that goes with (Raza, S. et al., 2010) that mention risk of malignancy in BIRAD IVa is 2-10% but not goes with (Giess, C. S. et al., 2012) which mention that risk of malignancy in BIRAD IVa category less than 2%, this variation in percentage of risk of malignancy in BIRAD IVa category may due to variation in sample sizes that have been studied in research. Percentage of malignancy in category IVa in our study were within the rage of defined by the guidelines. Most of category IVa lesions are benign, but undergo unnecessary biopsies. To better address that overtreatment of IVa lesions, new modalities such as elastography have been put into clinical use to lower the false positive rate. All 3 patients with cancer in this study were belong to age group 50 years and older (P =0.001) mean statistically significant associations this meant that increasing age is a risk factor for developing breast cancer as seen in (Giess, C. S. et al., 2012; Harvey, J. A. et al., 2009) Regarding family history and its association within malignancy risk, we found 7.4% of malignant lesions with positive family history while 0.9 % of those lesions were negative family history (P=0.04) statistically significant association. Same statistically significant association (P=0.03) has been find in relation of malignancy with marital status. 8.0% of malignant lesions seen in single patients while 0.9 % of malignant lesions seen in married patients. Most common type of benign lesions in our study according to histopathological results was fibroadenoma (88.7%) that goes with (Giess, C. S. et al., 2012). In our study common characteristics of lesions found in ultrasound were oval in shape (67.7 %), parallel in orientation (88.2%), non-circumscribed margin (52.9%), hypoechoic in echogenicity (63.2%), have posterior acoustic enhancement (59.6%), with calcification (11.0%) and absent vascularity in color Doppler (51.5%). Sensitivity, specificity, positive and negative predictive value of ultrasound in discrimination between BIRAD III and IVa lesions in our study was 66.7%, 46.6%, 2.7 % and 98.4% respectively while in (Malik, G. et al., 2006) the sensitivity and specificity for malignant lesions was 67% and 92.4% respectively in (Stavros, A. T. et al., 1995) the negative predictive value was ranged from 96 % to 100%, the low specificity in our study related to relative small sample size in comparison to the other studies.

CONCLUSION:
- The risk of malignancy in probably benign (BIRAD III) solid breast masses is less than 2% and surveillance rather than biopsy is recommended, and in low suspicion lesions (BIRAD IVa) is ranged from 2 % to 10%. Further work needs to be done to delineate sonographic criteria for BIRAD IVa, b and c subdivision.
- Palpability alone should not result in rise up the BIRAD grade of the lesion.
- Ultrasound has high negative predictive value in diagnosing breast masses.

Recommendations:
- Incorporating new modalities such as share wave elastography in clinical use to avoid unnecessary biopsy and lower the false positive rate.
- In equivocal cases we recommended to use other diagnostic modalities such as mammography and/or MRI.

REFERENCE:


