

Breast Cancer Screening and Diagnosis: Mammography and Ultrasound

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Overview

- Index Patient
- Introduction to Breast Imaging
 - Breast Imaging Modalities
 - ACR Appropriateness Criteria
 - BIRADS Reporting
 - Breast Anatomy
- Screening Mammography
 - Mammogram & Differential Diagnosis
- Evaluation of Suspicious Mammogram
- Diagnostic Imaging
 - Diagnostic Mammogram
 - Ultrasound & Differential Diagnosis
- Ultrasound-Guided Biopsies
 - FNA
 - Core Needle Biopsy

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Index Patient: Clinical History

Our patient is a 56 year-old woman who presents for her yearly screening mammogram.

- postmenopausal with no history of HRT
- no history of abnormal mammograms, palpable lumps or history of palpable breast lumps
- no family or personal history of breast cancer or cancer-related syndrome
- no history of chest radiation therapy

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Breast Imaging: Modalities

- Mammography
 - low-dose x-ray study used for screening and diagnostic purposes
 - taken in cranio-caudal (CC) and medio-lateral-oblique (MLO) views
 - only method of breast cancer screening shown to reduce mortality
- Ultrasound
 - used to identify the cystic vs solid nature of breast masses identified on mammogram
 - used for guidance of FNA and core needle biopsies of masses
- MRI
 - very high sensitivity for detecting breast masses, low sensitivity for calcifications
 - cost-effective for screening in women with $\geq 20\%$ lifetime risk of developing breast cancer
 - will not be discussed in this presentation

ACR Appropriateness Criteria: Screening for Breast Cancer in Average-Risk Women

Variant 3: Average-risk women: women with <15% lifetime risk of breast cancer, breasts not dense.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
Mammography screening	9		☼ ☼
MRI breast without and with contrast	3		○
US breast	2		○
MRI breast without contrast	1		○
FDG-PEM	1		☼ ☼ ☼ ☼
Tc-99m sestamibi BSGI	1		☼ ☼ ☼ ☼
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

ACR Appropriateness Criteria: Screening for Breast Cancer in Intermediate-Risk Women

Variant 2: **Intermediate-risk women: women with personal history of breast cancer, lobular neoplasia, atypical ductal hyperplasia, or 15%-20% lifetime risk of breast cancer.**

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
Mammography screening	9		☢ ☢
MRI breast without and with contrast	7	See statement regarding contrast in text under "Anticipated Exceptions."	○
US breast	5		○
FDG-PEM	2		☢ ☢ ☢ ☢
Tc-99m sestamibi BSGI	2		☢ ☢ ☢ ☢
MRI breast without contrast	1		○
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

ACR Appropriateness Criteria: Screening for Breast Cancer in High-Risk Women

Variant 1:

High-risk women: women with a BRCA gene mutation and their untested first- degree relatives, women with a history of chest irradiation between the ages of 10-30, women with 20% or greater lifetime risk of breast cancer.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
Mammography screening	9	Beginning at age 25-30 or 10 years before age of first-degree relative with breast cancer or 8 years after radiation therapy, but not before age of 25. Mammography and MRI are complementary examinations, both should be performed.	⊕ ⊕
MRI breast without and with contrast	9	Mammography and MRI are complementary examinations, both should be performed. See statement regarding contrast in text under “Anticipated Exceptions.”	○
US breast	6	If patient cannot have MRI.	○
FDG-PEM	2		⊕ ⊕ ⊕ ⊕
Tc-99m sestamibi BSGI	2		⊕ ⊕ ⊕ ⊕
MRI breast without contrast	1		○
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Breast Cancer Imaging: Reporting via BIRADS

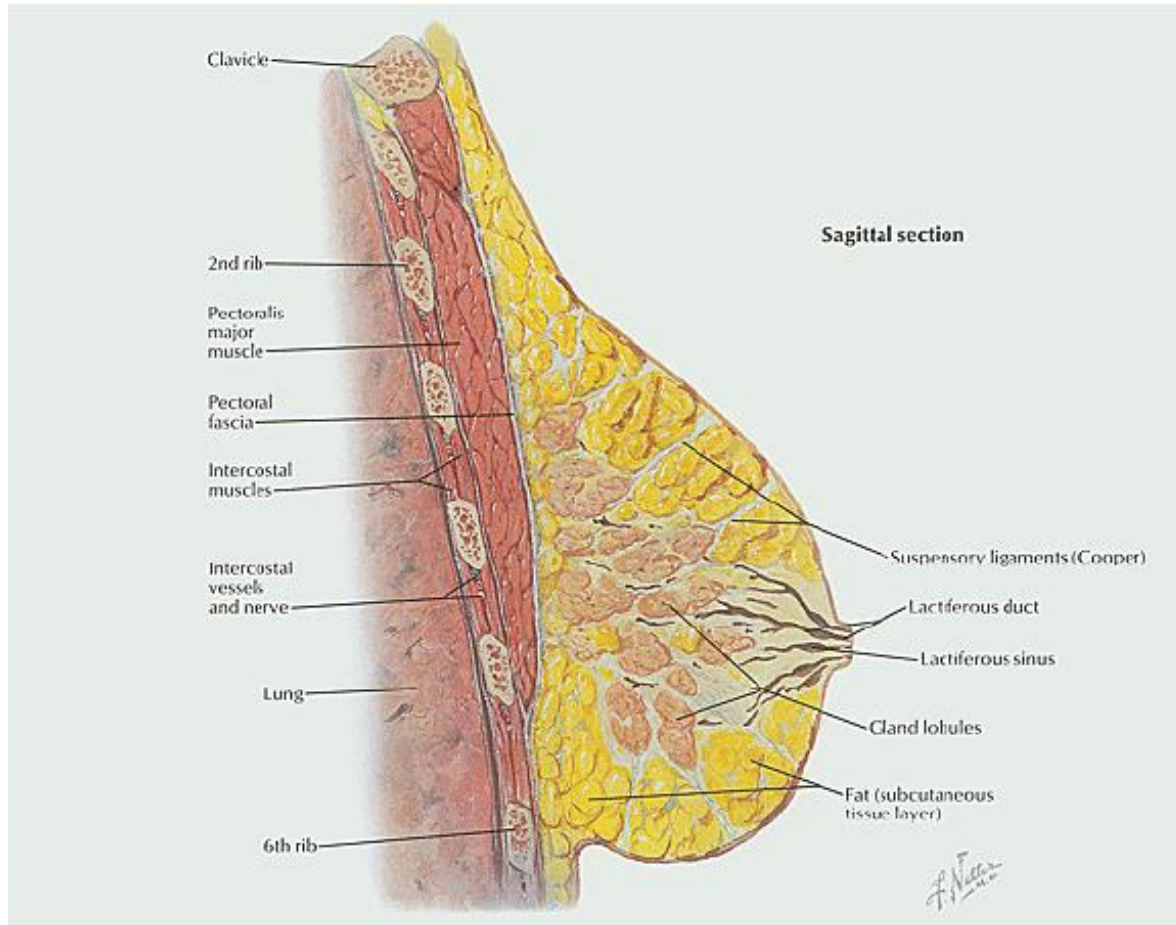
BI-RADS mammographic assessment categories

Assessment category	Recommendation
0: Incomplete	Need for further evaluation
1: Normal	Normal interval follow-up
2: Benign	Normal interval follow-up
3: Probably benign	A short interval follow-up is recommended
4: Suspicious abnormality	A biopsy should be considered
5: Highly suggestive of malignancy	Biopsy or surgery should be performed
6: Biopsy-proven carcinoma	Appropriate action should be taken

BI-RADS: Breast Imaging Reporting and Data System.

Source: *Breast Imaging Reporting and Data System (BI-RADS) Atlas. 4th Edition. American College of Radiology, Reston, VA, 2003.*

Breast Anatomy



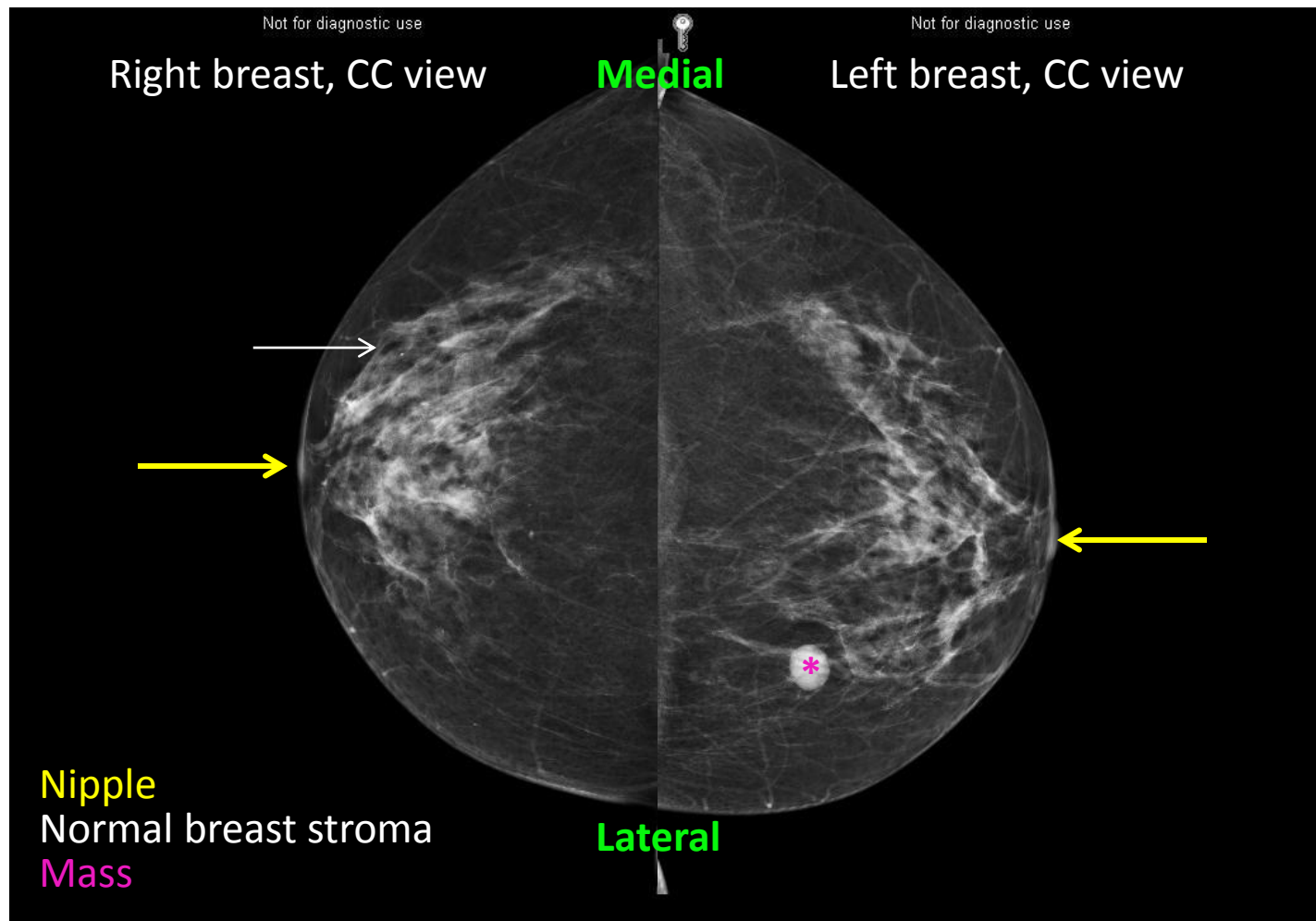
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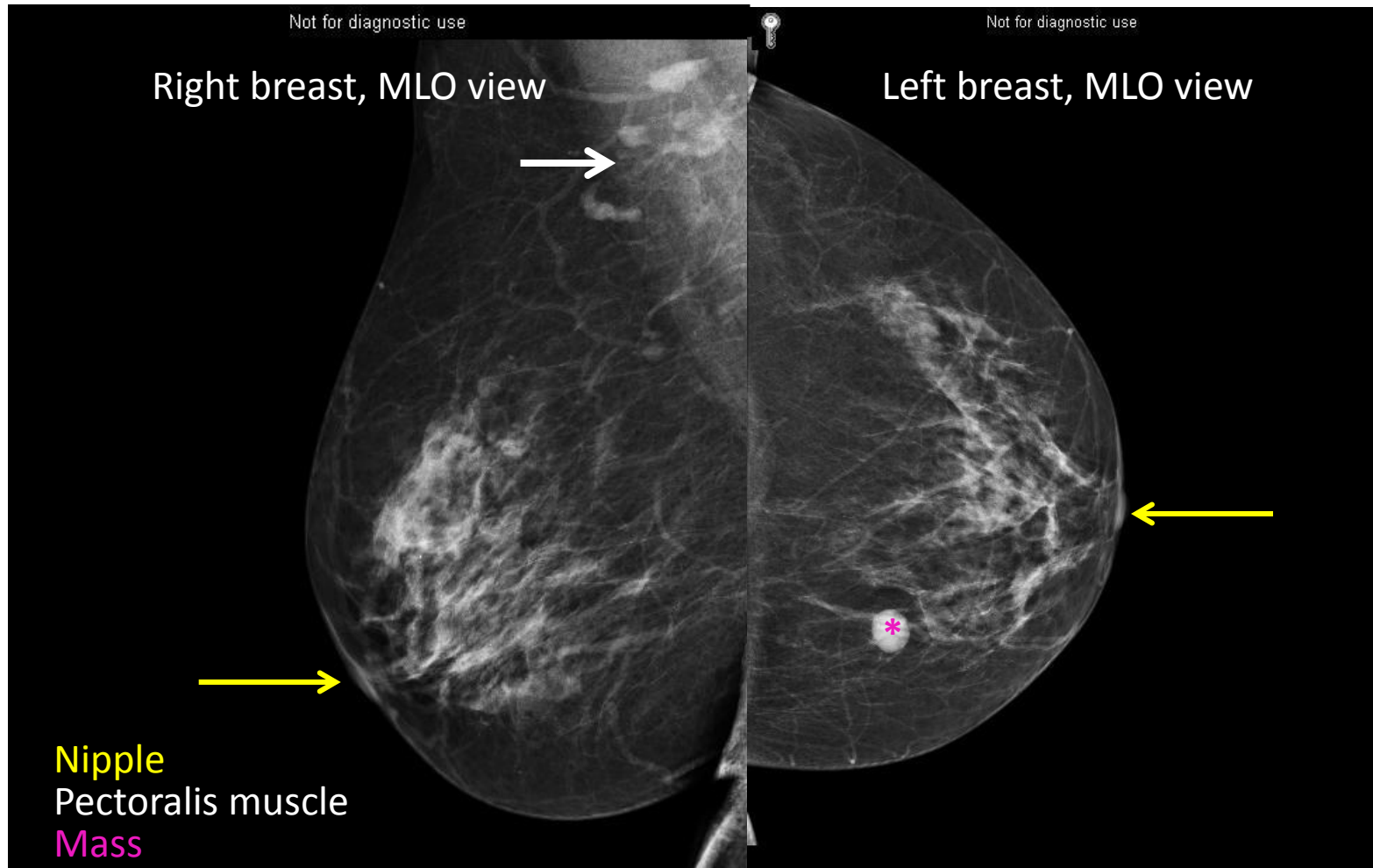
Mammography: Findings Suspicious for Malignancy

- Dominant mass with ill-defined margins
- Spiculated mass
- Ragged border
- Lobulated mass +/- comet tail
- Asymmetric density or ducts
- Architectural distortion
- Clustered microcalcifications
- Diffuse increase in density

Our Patient: Screening Mammogram



Our Patient: Screening Mammogram



Breast Mass on Mammogram: Differential Diagnosis

- Fibrocystic Disease
- Carcinoma
- Fibroadenoma
- Abscess
- Phyllodes tumor
- Fat necrosis

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Evaluation of Suspicious Mammogram: Facts and Next Steps

- 5% to 10% of all screening mammograms are interpreted as “abnormal.”
 - 90% of women with abnormal results do not have breast cancer
- Women whose screening mammography results are interpreted as "need additional imaging evaluation" (BIRADS 0) have a moderate risk for breast cancer
 - Should undergo **diagnostic mammography or ultrasonography** to decide whether a nonpalpable breast lesion should be biopsied

Evaluation of Suspicious Mammogram: Sensitivity and Specificity of Diagnostic Mammography

Table 3. Accuracy of Diagnostic Mammography in Women with a Nonpalpable Lesion or Breast Lump*

Measurement	Nonpalpable Abnormality	Lump
Sensitivity (95% CI), %	82.3 (78.1–85.9)	87.3 (84.4–89.7)
Specificity (95% CI), %	91.2 (90.1–92.2)	84.5 (83.1–85.8)
Positive predictive value (95% CI), %†	17.5 (15.6–19.6)	26.8 (24.5–29.2)
Positive likelihood ratio‡	9.4	5.6
Negative likelihood ratio‡	0.19	0.15

* Data are from the Breast Cancer Surveillance Consortium. Adapted from Barlow et al. (15). Performance of diagnostic mammography for women with breast signs or symptoms. *JNCI*. 2002;94(15):1155. By permission of Oxford University Press.

† Positive predictive value is defined as the proportion of women with an abnormal mammography result who have invasive cancer or ductal carcinoma in situ.

‡ Likelihood ratios are the ratio of diseased to nondiseased persons for a given test result.

ACR Appropriateness Criteria: Diagnostic Imaging of Nonpalpable Mammographic Findings

Clinical Condition: Nonpalpable Mammographic Findings (Excluding Calcifications)

Variant 4: Mass seen on screening mammogram (assuming mass has not previously been worked up). Circumscribed margins with no associated suspicious features. New or enlarging compared to prior examinations or no priors available. Next examination to perform. (See [Appendix 2](#) for additional steps in the workup of these patients.)

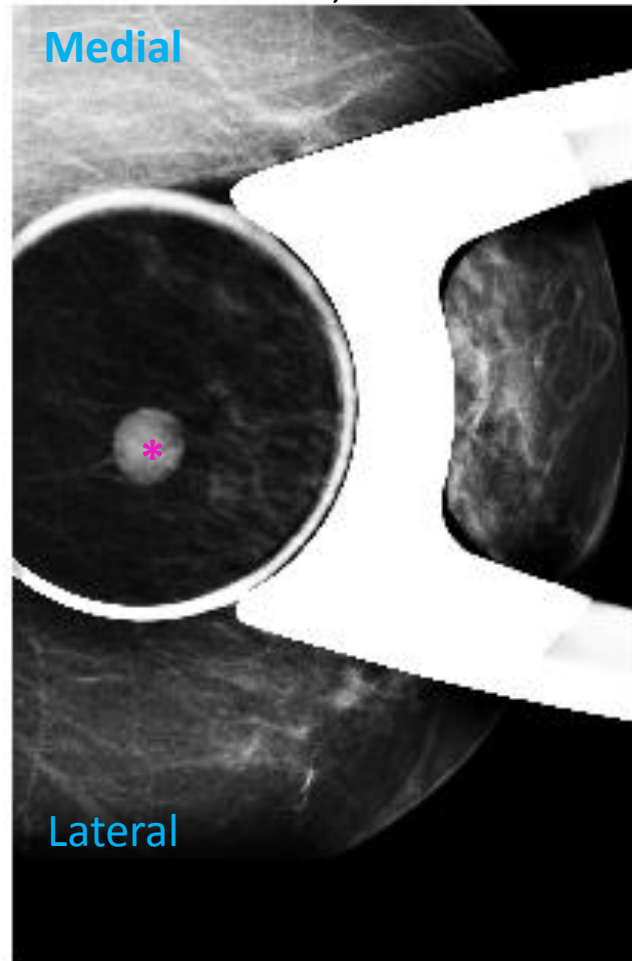
Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US breast	9		O
Mammography diagnostic	5	In selected cases, spot/magnification views may help elucidate margins, exclude intramammary node as etiology.	☢☢
Mammography short-interval follow-up	1		☢☢
MRI breast without and with contrast	1		O
MRI breast without contrast	1		O
Image-guided core biopsy breast	1		Varies
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

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Our Patient: Diagnostic Mammogram

Left Breast, CC view



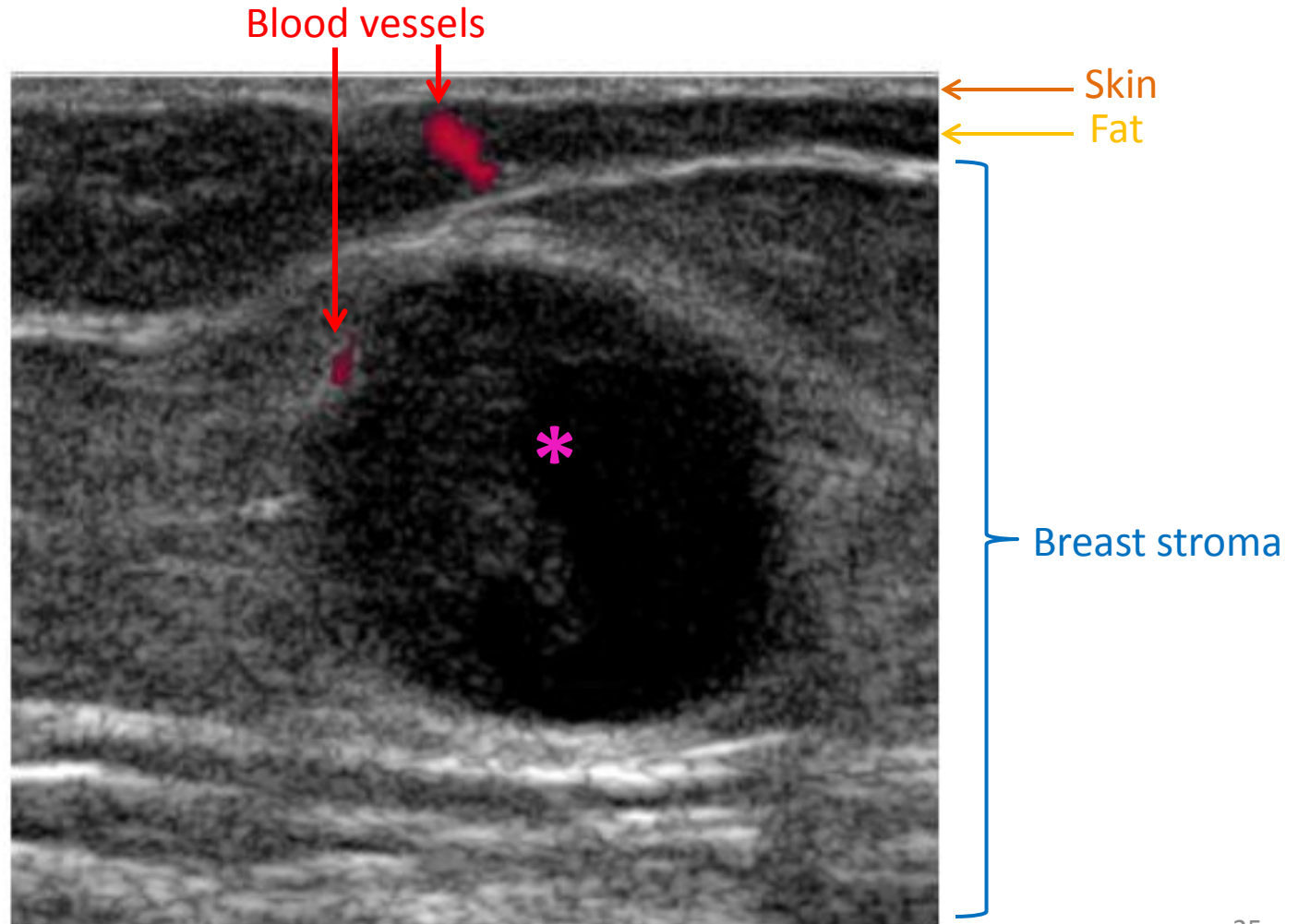
1.6 cm mass that persists
on spot compression

The mass persisted upon spot compression on diagnostic mammogram. Therefore, an ultrasound was obtained to further characterize the lesion.

Ultrasound: Findings Suspicious for Malignancy

- Spiculation
- Angular margins
- Hypoechoogenicity
- Shadowing
- Calcification
- Duct extension
- Branching pattern
- Microlobulation

Patient's Ultrasound



Hypoechoic mass
with cystic fluid

Hypoechoic Mass in Breast on Ultrasound: Differential Diagnosis

- Fibroadenoma
- Carcinoma
- Abscess
- Cyst
- Fibrocystic changes
- Intramammary lymph node
- Intraductal papilloma
- Sebaceous cyst

Putting It All Together: Differential Diagnosis of Solid Mass on Mammography and Hypoechoic Mass on Ultrasound

- Fibroadenoma
- Carcinoma
- Abscess (does not fit our patient's clinical picture)

BIRADS Assessment and Next Steps

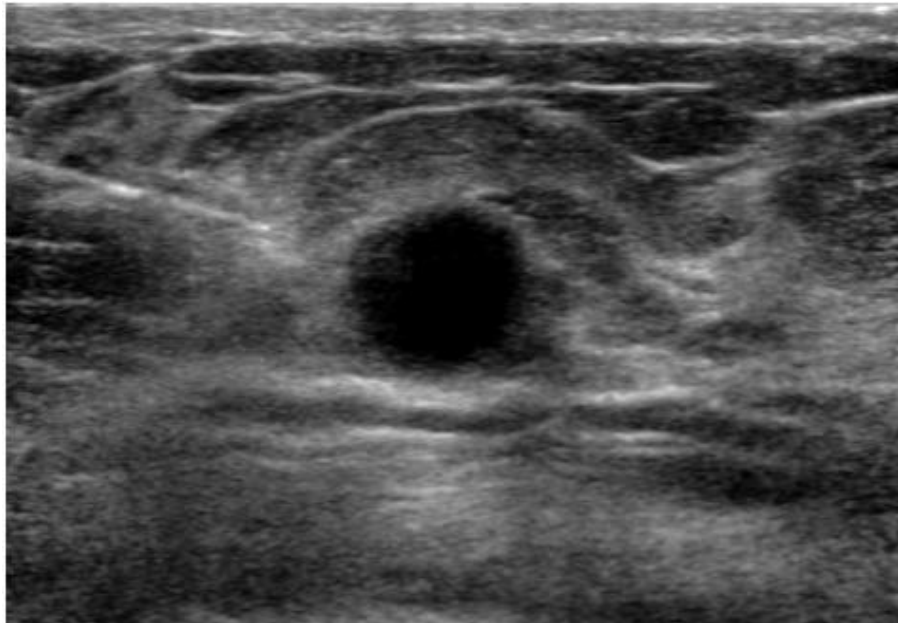
“BIRADS 4A- suspicious abnormality with low suspicion for malignancy. Biopsy is recommended.”

Interval Summary

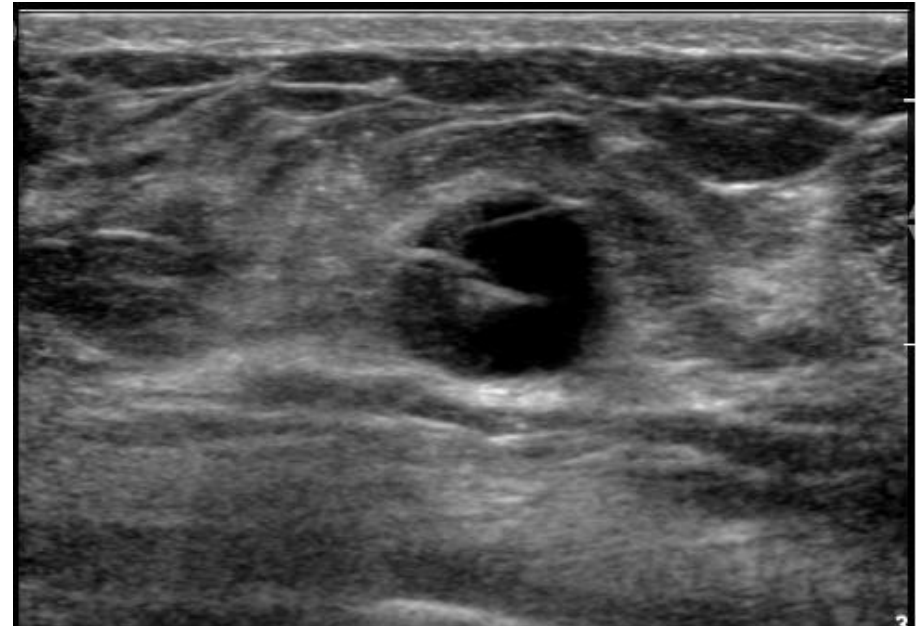
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Ultrasound-Guided Fine Needle Aspiration

Needle



Needle



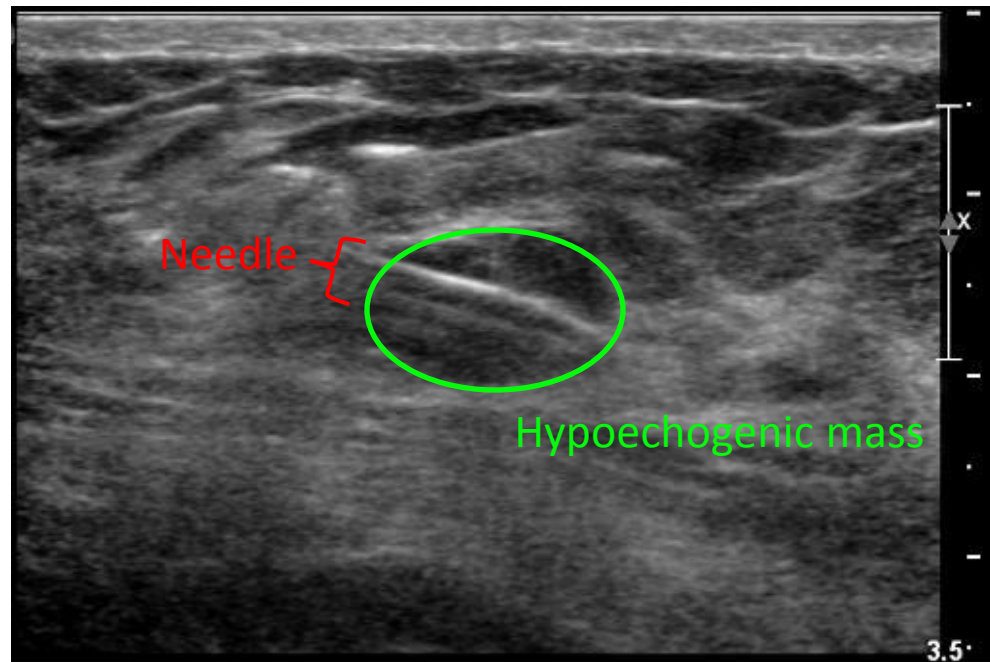
“Using standard aseptic technique, and 1 % Lidocaine for local anesthesia, an 16 gauge needle was advanced to the lesion using ultrasound guidance.

Approximately 1 cc of blood was aspirated. The procedure was stopped and a biopsy was subsequently performed. The aspirate was sent to cytology.”

Significance of Bloody Aspirate on FNA¹²

- Must be submitted for cytologic evaluation
- Causes:
 - Lesions other than a simple cyst (concerning for carcinoma)
 - Traumatic aspiration
- For our patient, the FNA was immediately stopped, and a core needle biopsy was performed.

Ultrasound-Guided Core Needle Biopsy



“Using standard aseptic technique, and 1 % Lidocaine for local anesthesia, a 13 gauge co-axial guide was placed at the margin of the lesion under ultrasound guidance. Six passes were made through the lesion with a 14 gauge Bard spring loaded biopsy device. An Inrad ribbon shaped biopsy marker clip was placed at the biopsy site under ultrasound guidance. The needles were removed and hemostasis was achieved.”

Pathology: Final Diagnosis

- Fine Needle Aspiration: positive for malignant cells, consistent with adenocarcinoma
- Core Needle Biopsy: “Well differentiated carcinoma at least in situ. This may represent an encapsulated papillary carcinoma. The lesion is up to 6 mm in this limited sample.”

References

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