UPDATED BIRADS

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PAST

- *The first edition of BI-RADS in 1992 introduced the practice of standardized reporting in mammography Subsequent editions of BI-RADS were released in 1995, 1998, and 2003.*

- *The 3rd edition (1998) was the first to contain an atlas of images to illustrate examples of each descriptor. . The 4th edition (2003) revised terminology; subdivided category 4 findings into a, b, and c; and introduced US and MRI standardized reporting.*

The primary advance of the 5th edition of BI-RADS is harmonization of lexicon terms across mammography, US, and MRI.

The assessment categories 0 through 6 estimate probability of malignancy and provide management

- *recommendations; further clarification of proper usage of category 3 is warranted.*

BI-RADS will likely continue to evolve for application to emerging breast imaging modalities, including molecular breast imaging, contrast-enhanced mammography, and positron emission mammography.

LEXICON

A lexicon is a list of standardized terms used to describe imaging findings concisely and reproducibly. The lexicons for mammography, US, and MRI have been validated in multiple studies across the different imaging modalities.

MAMMOGRAPHY CHANGES

Fourth Edition	Fifth Edition	Changes
A. Masses	**A. Masses**	
1. Shape	1. Shape (Fig 2)	Reordered “oval” and “round”
a. Round	a. Oval	Omitted “lobular”
b. Oval	b. Round	
c. Lobular	c. Irregular	
d. Irregular		
2. Margin	2. Margin	Reordered “microlobulated” and “obscured”
a. Circumscribed	a. Circumscribed	
b. Microlobulated	b. Obscured	
c. Obscured	c. Microlobulated	
d. Indistinct	d. Indistinct	
e. Spiculated	e. Spiculated	
3. Density	3. Density	Omitted “radiolucent”
a. High density	a. High density	
b. Equal density	b. Equal density	
c. Low density	c. Low density	
d. Fat-containing radiolucent	d. Fat-containing	

B. Calcifications	**B. Calcifications**	Combined "eggshell" and "lucent-centered" into "rim"; combined "punctate" and "round" into "round" (Fig 3)
1. Typically benign	1. Typically benign	Reordered "dystrophic," "milk of calcium," and "suture"
a. Skin calcifications	a. Skin	
b. Vascular calcifications	b. Vascular	
c. Coarse or "popcorn-like" calcifications	c. Coarse or "popcorn-like"	
d. Large rod-like calcifications	d. Large rod-like	
e. Round calcifications	e. Round	
f. Lucent-centered calcifications	f. Rim	
g. Eggshell or rim calcifications	g. Dystrophic	
h. Milk of calcium calcifications	h. Milk of calcium	
i. Suture calcifications	i. Suture	
j. Dystrophic calcifications		
2. Intermediate concern, suspicious calcifications	2. Suspicious morphology (Fig 4)	Combined "intermediate concern, suspicious calcifications" and "higher probability malignancy"
a. Amorphous or indistinct calcifications	a. Amorphous	Omitted "indistinct"
b. Coarse heterogeneous calcifications	b. Coarse heterogeneous	
3. Higher probability malignancy	c. Fine pleomorphic	Added "fine pleomorphic"
a. Fine pleomorphic calcifications	d. Fine linear or fine linear branching	Added "fine linear or fine linear branching"
b. Fine linear or fine linear branching calcifications		
4. Distribution	3. Distribution	Omitted "scattered"
a. Diffuse/scattered	a. Diffuse	Omitted "clustered"
b. Regional	b. Regional	
c. Grouped or clustered	c. Grouped	
d. Linear	d. Linear	
e. Segmental	e. Segmental	
C. Architectural distortion	**C. Architectural distortion**	

D. Special cases 1. Asymmetric tubular structure/ solitary dilated duct 2. Intramammary node 3. Global asymmetry 4. Focal asymmetry	**D. Asymmetries** 1. Asymmetry 2. Global asymmetry 3. Focal asymmetry 4. Developing asymmetry (Fig 5)	Added section for asymmetries alone Added “developing asymmetry”
	E. Intramammary lymph node	Separated findings of intramammary lymph node, skin lesion, and solitary dilated duct Omitted “asymmetric tubular structure”
	F. Skin lesion	
	G. Solitary dilated duct	

Fourth Edition	Fifth Edition	Changes
E. Associated findings 1. Skin retraction 2. Nipple retraction 3. Skin thickening 4. Trabecular thickening 5. Skin lesion 6. Axillary adenopathy 7. Architectural distortion 8. Calcifications	**H. Associated features** 1. Skin retraction 2. Nipple retraction 3. Skin thickening 4. Trabecular thickening 5. Axillary adenopathy 6. Architectural distortion 7. Calcifications	Omitted "skin lesion" (made into separate finding)
F. Location of lesion 1. Location 2. Depth	**I. Location of lesion** 1. Laterality 2. Quadrant and clock face 3. Depth 4. Distance from the nipple	Added specification of "laterality" Added "quadrant and clock face" Added "distance from the nipple"

Fourth Edition	Fifth Edition	Changes
Category 0: Need additional imaging evaluation and/or prior mammograms for comparison	Category 0: Incomplete—need additional imaging evaluation and/or prior mammograms for comparison	
Category 1: Negative	Category 1: Negative	
Category 2: Benign finding(s)	Category 2: Benign	
Category 3: Probably benign finding—initial short-interval follow-up suggested	Category 3: Probably benign	
Category 4: Suspicious abnormality—biopsy should be considered	Category 4: Suspicious A. Low suspicion for malignancy B. Moderate suspicion for malignancy C. High suspicion for malignancy	Added subclassifications under "suspicious"
Category 5: Highly suggestive of malignancy—appropriate action should be taken	Category 5: Highly suggestive of malignancy	Recommendation removed
Category 6: Known biopsy-proven malignancy—appropriate action should be taken	Category 6: Known biopsy-proven malignancy	Recommendation removed

CEM

- *ACR guideline in 2022*
- *To perform CEM, intravenous iodinated contrast is administered and two exposures (low- and high-energy) are made using the standard mammography projections of craniocaudal (CC) and mediolateral oblique (MLO).*
- *Separate descriptions of the LE and RC images as well as an overall description should be included.*
- *The LE and the RC images should be described separately, and the final assessment should be based on the most abnormal findings on each of these components.*

INDICATIONS

1. *determination of extent of disease in newly diagnosed breast cancer*
2. *response to neoadjuvant chemotherapy*
3. *problem solving*
4. *intermediate and high-risk screening.*
5. *an alternative to MRI when the patient is not a candidate for MRI.*

WORK FLOW

- *For MRI, the recommendation has been to schedule during week 2, but several studies have shown that outcomes may not be affected by the stage of the menstrual cycle, and this may also be true for CEM.*

- *a power injector at a rate of 3 ml/sec.*

- *the patient is positioned in the standard four mammography projections and two exposures are taken for each projection after a delay of approximately 2 minutes .*

Breast Tissue	Terms	
A. Breast Composition	a. Almost entirely fatty b. Scattered areas of fibroglandular density c. Heterogeneously dense d. Extremely dense	
B. Background parenchymal enhancement (BPE)	1. Level	a. Minimal b. Mild c. Moderate d. Marked
	2. Symmetric or Asymmetric	a. Symmetric b. Asymmetric

Finding	Terms	
A. Mass	1. Shape	a. Oval b. Round c. Irregular
	2. Margins	a. Circumscribed b. Not circumscribed i. Irregular ii. Spiculated
	3. Internal Enhancement Characteristics	a. Homogeneous b. Heterogeneous c. Rim enhancement

B. Non-mass Enhancement (NME)	1. Distribution	a. Diffuse b. Multiple regions c. Regional d. Focal e. Linear f. Segmental
	2. Internal Enhancement Pattern	a. Homogeneous b. Heterogeneous c. Clumped
C. Enhancing Asymmetry	Internal Enhancement Pattern	a. Homogeneous b. Heterogeneous
D. Lesion Conspicuity	a. Low b. Moderate c. High	

Morphology	Refer to mammography lexicon
Internal Enhancement Pattern	a. Homogeneous b. Heterogeneous c. Rim
Extent of Enhancement	a. Mammographic lesion partially enhances b. Mammography lesion completely enhances c. Enhancement extends beyond mammographic lesion d. No enhancement of the mammographic lesion but enhancement in the adjacent tissue
Lesion Conspicuity	a. Low b. Moderate c. High

ASSOCIATED FEATURES:

Associated Features	
	a. Nipple retraction b. Nipple invasion c. Skin retraction d. Skin thickening e. Skin invasion f. Axillary adenopathy

The Mammography Quality Standards Act (MQSA) regulations mandate that each mammography report include the assessment category. Specifically, the report must include the assessment category word, rather than the number.

For example, a negative screening mammogram needs to state "negative." Stating solely "category 1" or "BI-RADS category 1" is insufficient to comply with the federal law.

- *Although not required by MQSA, the same assessment categories and their accompanying recommendation should also be used for US and MRI.*

BREAST COMPOSITION

- *Breast composition is determined by subjective analysis of the area of attenuating glandular breast tissue on mammography and is divided into four categories:*

1. *almost entirely fatty*
2. *scattered areas of fibro glandular density*
3. *heterogeneously dense*
4. *extremely dense.*

- *Density on mammography was previously coded as density categories 1 through 4, creating confusion with the assessment categories.*
- *In the 5th edition, breast composition is now coded as density a, b, c, or d for fatty through extremely dense.*
- *In addition, percentiles and quartiles assigned to breast composition on mammography have been removed, and density is now assessed visually.*
- *A breast may be assessed as dense on the basis of focal areas of dense breast tissue that potentially mask the presence of cancer, even if the entire breast is nondense.*

the mammography lexicon definitions of “mass” and “asymmetry” do not take into account DBT technique.

The mammography lexicon defines a mass as a finding that is seen on two views.

- *However, using DBT, a “mass” or space-occupying lesion may be seen over multiple planes in a single projection.*

ULTRASONOGRAPHY

Fourth Edition	Fifth Edition	Changes
A. Background echotexture	**A. Tissue composition**	Renamed
1. Homogeneous background echotexture—fat	1. Homogeneous background echotexture—fat	
2. Homogeneous background echotexture—fibroglandular	2. Homogeneous background echotexture—fibroglandular	
3. Heterogeneous background	3. Heterogeneous background echotexture	

B. Masses	B. Masses	
1. Shape	1. Shape	
a. Oval	a. Oval	
b. Round	b. Round	
c. Irregular	c. Irregular	
2. Orientation	2. Orientation	
a. Parallel	a. Parallel	
b. Not parallel	b. Not parallel	
3. Margin	3. Margin	
a. Circumscribed	a. Circumscribed	
b. Not circumscribed	b. Not circumscribed	
i. Indistinct	i. Indistinct	
ii. Angular	ii. Angular	
iii. Microlobulated	iii. Microlobulated	
iv. Spiculated	iv. Spiculated	
4. Lesion boundary	4. Echo pattern	Omitted “lesion boundary” category
a. Abrupt interface	a. Anechoic	
b. Echogenic halo	b. Hyperechoic	Changed “complex” to “complex cystic and solid”
5. Echo pattern	c. Complex cystic and solid (Fig 8)	Added “heterogeneous” descriptor for echo pattern
a. Anechoic	d. Hypoechoic	
b. Hyperechoic	e. Isoechoic	
c. Complex	f. Heterogeneous (Fig 9)	
d. Hypoechoic	5. Posterior features	Omitted “surrounding tissue” category (some descriptors added to section D)
e. Isoechoic	a. No posterior acoustic features	
6. Posterior acoustic features	b. Enhancement	
a. No posterior acoustic features	c. Shadowing	
b. Enhancement	d. Combined pattern	
c. Shadowing		
d. Combined pattern		
7. Surrounding tissue		
a. Ducts		
b. Changes in Cooper ligaments		
c. Edema		
d. Architectural distortion		
e. Skin thickening		
f. Skin retraction/irregularity		

C. Calcifications 1. Macrocalcifications 2. Microcalcifications a. Microcalcifications out of a mass b. Microcalcifications in a mass	**C. Calcifications** 1. Calcifications in a mass 2. Calcifications outside of a mass 3. Intraductal calcifications (Fig 10)	Omitted micro/macro distinction Added “intraductal”
	D. Associated features 1. Architectural distortion 2. Duct changes 3. Skin changes a. Skin thickening b. Skin retraction 4. Edema 5. Vascularity a. Absent b. Internal vascularity c. Vessels in rim	Added “associated features” category (includes descriptors from previous “lesion boundary” and “vascularity” categories) Added descriptors for elasticity assessment

Fourth Edition	Fifth Edition	Changes
	6. Elasticity assessment a. Soft b. Intermediate c. Hard	
D. Special cases 1. Clustered microcysts 2. Complicated cysts 3. Mass in or on skin 4. Foreign body 5. Lymph nodes—intramammary 6. Lymph nodes—axillary	**E. Special cases** (Fig 11) 1. Simple cyst 2. Clustered microcysts 3. Complicated cysts 4. Mass in or on skin 5. Foreign body, including implants 6. Lymph nodes—intramammary 7. Lymph nodes—axillary 8. Vascular abnormalities a. Arteriovenous malformations b. Mondor disease 9. Postsurgical fluid collection 10. Fat necrosis	Expanded "special cases"
E. Vascularity 1. Present or not present 2. Present immediately adjacent to lesion 3. Diffusely increased vascularity in surrounding tissue		Omitted dedicated "vascularity" section

The change in the US lexicon of “background echotexture” to “tissue composition” represents an effort to harmonize “breast composition” on US with mammographic density and breast fibro glandular tissue on MRI.

MRI

A. Focus/Foci	C. Focus	Changed definition of "focus"
B. Mass	**D. Masses**	Omitted "lobulated"
1. Shape	1. Shape	
a. Round	a. Oval (includes lobulated)	
b. Oval	b. Round	
c. Lobulated	c. Irregular	
d. Irregular		
2. Margin	2. Margin	
a. Smooth margin	a. Circumscribed	
b. Irregular margin	b. Not circumscribed	
c. Spiculated margin	i. Irregular	
3. Internal enhancement characteristics	ii. Spiculated	
a. Homogeneous	3. Internal enhancement characteristics	Omitted "enhancing internal septations" and "central enhancement"
b. Heterogeneous	a. Homogeneous	
c. Rim enhancement	b. Heterogeneous	
d. Dark internal septations	c. Rim enhancement	
e. Enhancing internal septations	d. Dark internal septations	
f. Central enhancement		

C. Non-mass–like enhancement 1. Distribution a. Focal area b. Linear enhancement c. Ductal enhancement d. Segmental enhancement e. Regional enhancement f. Multiple regions of enhancement g. Diffuse enhancement 2. Internal enhancement patterns a. Homogeneous enhancement b. Heterogeneous enhancement c. Stippled/punctate enhancement d. Clumped enhancement e. Reticular/dendritic enhancement 3. Symmetric or asymmetric a. Symmetric b. Asymmetric	**E. Nonmass enhancement** 1. Distribution a. Focal b. Linear c. Segmental d. Regional e. Multiple regions f. Diffuse 2. Internal enhancement patterns a. Homogeneous b. Heterogeneous c. Clumped d. Clustered ring (Fig 15)	Omitted “ductal” Omitted “stippled/punctate” Added/replaced “clustered ring”
	F. Intramammary lymph node (Fig 16)	
	G. Skin lesion (Fig 17)	
	H. Nonenhancing findings (Fig 18) 1. Ductal high signal intensity on precontrast TI-weighted images 2. Cyst 3. Postoperative collections (hematoma/seroma)	Separated “associated findings” into “nonenhancing findings,” “associated findings,” and “fat-containing lesions”

Fourth Edition	Fifth Edition	Changes
	4. Posttherapy skin thickening and trabecular thickening 5. Nonenhancing mass 6. Architectural distortion 7. Signal void from foreign bodies, clips, etc	
D. Associated findings 1. Nipple retraction or inversion 2. Ductal precontrast high signal intensity 3. Skin retraction 4. Skin thickening 5. Skin invasion 6. Edema 7. Lymphadenopathy 8. Pectoralis muscle invasion 9. Chest wall invasion 10. Hematoma/blood 11. Abnormal signal void 12. Cyst	**I. Associated findings** (Fig 19) 1. Nipple retraction 2. Nipple invasion 3. Skin retraction 4. Skin thickening 5. Skin invasion a. Direct invasion b. Inflammatory cancer 6. Axillary adenopathy 7. Pectoralis muscle invasion 8. Chest wall invasion 9. Architectural distortion	
	J. Fat-containing lesions (Fig 20) 1. Lymph nodes a. Normal b. Abnormal 2. Fat necrosis 3. Hamartoma 4. Postoperative seroma/ hematoma with fat	

D. Associated findings 1. Nipple retraction or inversion 2. Ductal precontrast high signal intensity 3. Skin retraction 4. Skin thickening 5. Skin invasion 6. Edema 7. Lymphadenopathy 8. Pectoralis muscle invasion 9. Chest wall invasion 10. Hematoma/blood 11. Abnormal signal void 12. Cyst	**I. Associated findings** (Fig 19) 1. Nipple retraction 2. Nipple invasion 3. Skin retraction 4. Skin thickening 5. Skin invasion a. Direct invasion b. Inflammatory cancer 6. Axillary adenopathy 7. Pectoralis muscle invasion 8. Chest wall invasion 9. Architectural distortion
	J. Fat-containing lesions (Fig 20) 1. Lymph nodes a. Normal b. Abnormal 2. Fat necrosis 3. Hamartoma 4. Postoperative seroma/ hematoma with fat
E. Lesion location 1. Locations 2. Depth	**K. Location of lesion** 1. Location 2. Depth

F. Kinetic curve assessment 1. Sample for and report on the worst-looking kinetic curve 2. Signal intensity/time curve description a. Initial enhancement phase i. Slow ii. Medium iii. Rapid b. Delayed phase i. Persistent ii. Plateau iii. Washout	**L. Kinetic curve assessment** Signal intensity/time curve description 1. Initial phase a. Slow b. Medium c. Fast 2. Delayed phase a. Persistent b. Plateau c. Washout	Changed “rapid” to “fast”
	M. Implants (Fig 21) 1. Implant material and lumen type a. Saline b. Silicone i. Intact ii. Ruptured c. Other implant material d. Lumen type 2. Implant location a. Retroglandular b. Retropectoral 3. Abnormal implant contour a. Focal bulge 4. Intracapsular silicone findings a. Radial folds b. Subcapsular line c. Keyhole sign d. Linguine sign 5. Extracapsular silicone a. Breast b. Lymph nodes 6. Water droplets 7. Peri-implant fluid	Added “implants” section

Background parenchymal enhancement (BPE) is distinct from mammographic density or MRI fibro glandular tissue. BPE, independent of breast density, is more clearly associated with increased breast cancer risk. This association has been shown on MRI and MBI.

CEM enhancement may also be associated with increased breast cancer risk .

Screening MRI was previously recommended to be scheduled in the second week of the menstrual cycle to decrease background BPE . However, timing of the MRI based on menstrual cycle has been questioned on the basis of a study of over 1200 premenopausal women that indicated that the menstrual cycle phase did not differentiate outcomes

What BI-RADS Changes Are on the Way for Breast MRI Reporting?

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Conferences | RSNA

Article

In a recent lecture at the Radiological Society of North America (RSNA) conference, Wendy DeMartini, MD, discussed a variety of preliminary proposed changes to the Breast Imaging Reporting and Data System (BI-RADS) for breast magnetic resonance imaging (MRI) examinations.

1. Reporting of new cross-modality structured clinical indications and optional subcategory indications. When performing asymptomatic screening, subcategory indications could include elevated breast cancer risk, dense breasts or assessment of patients who have completed breast cancer treatment, according to Dr. DeMartini. For diagnostic workup with breast MRI, subcategory indications could include clinical findings, imaging findings, Category 3 follow-up, biopsy follow-up or implant assessment.

2. Revised acquisition parameters include descriptions of standard full protocol contrast-enhanced breast MRI with a least two post-contrast series, and abbreviated contrast-enhanced breast MRI, which is usually performed in less than 10 minutes and includes at least one post-contrast series. Dr. DeMartini also noted there is discussion of "faster" hybrid techniques with early high temporal series, also referred to as "ultra-fast imaging".

3. The expanded acquisition parameters also include discussion of diffusion-weighted imaging (DWI) as a complement to dynamic contrast-enhanced (DCE) MRI for further characterization of findings seen with DCE. Dr. DeMartini noted there are no current plans to introduce BI-RADS reporting of DWI at this time but noted an international consensus statement from the European Society of Breast Imaging (EUSOBI) that provides some structure for reporting DWI.[1]

4. Removal of the "focus" finding type from the BI-RADS lexicon. Dr. DeMartini noted these tiny marks of enhancement generally do not have clinical significance and are typically part of the background or other benign enhancement of the breast.

"With modern breast MRI techniques, we should be able to characterize findings of less than or equal to 5 mm as a small mass that meets criteria for a mass ... or focal non-mass enhancement," maintained Dr. Demartini.

5. Introduction of T2 signal intensity as a descriptor for masses. Dr. DeMartini noted that both benign and malignant enhancing masses can be T2 hyperintense. She added that a T2 hyperintense mass that is oval and circumscribed with dark internal septations or homogeneous internal enhancement has a very low probability of malignancy at less than 2 percent. Dr. DeMartini said radiologists should characterize T2 masses as hyperintense or not hyperintense. She said hyperintense masses are uniformly bright and as bright as a normal-appearing lymph node.

6. Addition of new section for lymph node reporting. Specifically, for breast MRI, one should note whether intramammary, axillary and internal mammary lymph nodes are normal or abnormal appearing, according to Dr. DeMartini. Based on the current evidence, Dr. DeMartini said abnormal-appearing axillary lymph nodes have subjectively asymmetric morphological features in comparison to ipsilateral or contralateral nodes, particularly when nodes are ipsilateral to current or prior breast cancer. She emphasized there is currently no quantitative threshold on breast MRI for asymmetric cortical thickening. Dr. DeMartini also added that asymmetric rounding or the absence of hila is not a sole criterion for abnormal axillary lymph nodes as this can be the case for many small normal lymph nodes.

7. Clarifying the use of BI-RADS Category 3 for breast MRI. While acknowledging multiple studies that show BI-RADS Category 3 "can be employed with malignancy rates less than or equal to 2 percent," Dr. DeMartini said there is a lack of evidence on BI-RADS Category 3 for breast MRI in comparison to the evidence for mammography and ultrasound. Suggesting that Category 3 may be overutilized for breast MRI findings, Dr. DeMartini noted a goal of reserving Category 3 for less than 5 percent of examinations and urged caution in regard to the use of Category 3 for non-baseline examinations.

8. Addition of BI-RADS Category 4 subdivisions 4A-4C. The proposed preliminary changes would include: Category 4A lesions with a 2.5 percent likelihood of malignancy; Category 4B lesions with a 27.6 percent likelihood of malignancy, and Category 4C lesions with an 83.3 percent likelihood of malignancy. Dr. DeMartini added that this risk stratification falls in line with similar BI-RADS Category 4 subcategories for mammography and ultrasound imaging. She noted the subcategories offer "potential benefits for more meaningful practice audits for rad-path correlation and for the setting of patient/provider expectations."

Utility of BI-RADS Assessment Category 4 Subdivisions for Screening Breast MRI

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OBJECTIVE. BI-RADS for mammography and ultrasound subdivides category 4 assessments by likelihood of malignancy into categories 4A (> 2% to ≤ 10%), 4B (> 10% to ≤ 50%), and 4C (> 50% to < 95%). Category 4 is not subdivided for breast MRI because of a paucity of data. The purpose of the present study is to determine the utility of categories 4A, 4B, and 4C for MRI by calculating their positive predictive values (PPVs) and comparing them with BI-RADS–specified rates of malignancy for mammography and ultrasound.

MATERIALS AND METHODS. All screening breast MRI examinations performed from July 1, 2010, through June 30, 2013, were included in this study. We identified in medical records prospectively assigned MRI BI-RADS categories, including category 4 subdivisions, which are used routinely in our practice. Benign versus malignant outcomes were determined by pathologic analysis, findings from 12 months or more clinical or imaging follow-up, or a combination of these methods. Distribution of BI-RADS categories and positive predictive value level 2 (PPV2; based on recommendation for tissue diagnosis) for categories 4 (including its subdivisions) and 5 were calculated.

RESULTS. Of 860 screening breast MRI examinations performed for 566 women (mean age, 47 years), 82 with a BI-RADS category 4 assessment were identified. A total of 18 malignancies were found among 84 category 4 and 5 assessments, for an overall PPV2 of 21.4% (18/84). For category 4 subdivisions, PPV2s were as follows: for category 4A, 2.5% (1/40); for category 4B, 27.6% (8/29); for category 4C, 83.3% (5/6); and for category 4 (not otherwise specified), 28.6% (2/7).

CONCLUSION. Category 4 subdivisions for MRI yielded malignancy rates within BI-RADS–specified ranges, supporting their use for benefits to patient care and more meaningful practice audits.

HARMONIZATION

Harmonization of terminology across mammography, US, and MRI allows accurate correlation between imaging modalities, communication among radiologists, and uniform reporting to referring clinicians.

- *exceptions to harmonization involve descriptors specific to an imaging modality, such as mammographic density, US echogenicity, and MRI signal intensity.*

  When lexicon descriptors overlap between benign and malignant features or are discordant between imaging modalities, the most suspicious feature is used to recommend an assessment category and management.
- *If a patient presents for diagnostic evaluation and both mammography and US are performed, then a combined report containing a section for mammography findings and a separate section for US findings, with a final overall assessment and recommendation for both modalities, is encouraged and ideal for decreasing confusion.*

IMPORTANT CLUES

The assessment categories predict benign versus malignant breast disease .

- *Categories 0, 1, and 2 are used at screening mammography with the same implication.*
- *Category 0 indicates an incomplete study, whereas categories 1 and 2 indicate a benign finding.*

Categories 3, 4, and 5 are assigned after a complete diagnostic imaging evaluation.

BI-RADS CATEGORY 3

BI-RADS category 3 is associated with a less than 2% likelihood of malignancy and is not intended to be used when a radiologist is unsure of a finding. A favorable outcome of appropriate use of BI-RADS category 3 is reducing the number of false-positive biopsies while maintaining an acceptable cancer detection rate.

- *Unlike screening US and screening MRI examinations, a lesion should **not** be categorized as a probably benign finding according to a **screening mammogram** because it is **incompletely evaluated**.*

- *In fact, more advanced-stage breast cancers were found if a BI-RADS category 3 assessment was given directly from a screening mammogram*

BI-RADS CATEGORY 3 DEFINITION ON MAMMOGRAPHY

- *Three BI-RADS category 3 findings that have been validated for use at baseline mammography or in examinations with no available prior imaging*

1. *grouped round (punctate) calcifications*
2. *circumscribed solitary mass*
3. *a focal asymmetry with no US correlate after complete diagnostic evaluation.*

US CRITERIA FOR BI-RADS CATEGORY 3

Category 3: Probably Benign (Guidance chapter, see page 139.)

Assessment category 3, probably benign, is ***not*** an indeterminate category for use simply when the radiologist is unsure whether to render a benign (BI-RADS® category 2) or suspicious (BI-RADS® category 4) assessment, but one that is reserved for specific imaging findings known to have > 0% but ≤ 2% likelihood of malignancy. ***For US, there is robust evidence that a solid mass with a circumscribed margin, oval shape, and parallel orientation (most commonly fibroadenoma), and an isolated complicated cyst have a likelihood of malignancy in the defined (≤ 2%) probably benign range, for which short-interval (6-month) follow-up sonography and then periodic sonographic surveillance may represent appropriate management.[2–4] Similar data have been reported for clustered microcysts, but these data are less strong because they involve many fewer cases.***[2] The use of assessment category 3 for sonographic findings other than these three should be considered only if the radiologist has personal experience to justify a watchful-waiting approach, preferably involving observation of a sufficient number of cases of an additional sonographic finding to suggest a likelihood of malignancy within the defined (≤ 2%) probably benign range.

d. As at mammography, multiple bilateral circumscribed masses usually are assessed as benign (category 2) unless one mass has different imaging features than all the others. In the unusual circumstance in which the interpreting physician chooses to describe multiple benign-appearing masses individually within the US report, the masses should

Reassessment and Follow-Up Results of BI-RADS Category 3 Lesions Detected on Screening Breast Ultrasound

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OBJECTIVE. The purpose of this study is to determine the frequency and the malignancy rate of BI-RADS category 3 lesions detected on screening breast ultrasound and to reassess whether they satisfied the requirements of the American College of Radiology Imaging Network (ACRIN) 6666 protocol.

MATERIALS AND METHODS. Of 28,796 asymptomatic women who underwent screening mammography during 2 years, 12,187 underwent additional ultrasound as part of the screening. Patients for whom BI-RADS category 3 lesions were seen on the ultrasound were selected. We reviewed the initial ultrasound showing BI-RADS category 3 lesions and mammograms. We also investigated the clinical outcome of these lesions using the reference standard of a combination of pathologic analysis and follow-up for at least 24 months.

RESULTS. The frequency of BI-RADS category 3 lesions detected on screening ultrasound was 14.6% (1783/12,187). Of the 1164 patients with a follow-up duration of at least 24 months or whose lesions were biopsied, eight were eventually proven to have malignancy (0.7%). The malignancy rate was 2.2% (4/184) for patients with abnormal mammograms and 0.4% (4/980) for those with normal mammograms. When the ACRIN 6666 protocols were strictly applied, 225 (19.3%) lesions were retrospectively recategorized as BI-RADS category 4 (n = 12) or category 2 (n = 213). All detected malignancies were early breast cancers with no lymph node metastasis.

CONCLUSION. Although the frequency of ultrasound BI-RADS category 3 lesions is considerably high (14.6%), the malignancy rate is very low (0.7%), especially in patients with a normal mammogram. Therefore, with BI-RADS category 3 assessment, careful evaluation is required to avoid unnecessary short-interval follow-up or biopsy.

STRICT US CRITERIA FOR US BIRADS CATEGORY 3

1. *An oval mass parallel to skin and hypoechoic to fat with circumscribed borders and no posterior features or minimal posterior enhancement including multiple bilateral masses with these features if seen only on US*
2. *A hyperechoic mass with central hypoechoic to anechoic components suggestive of fat necrosis*
3. *A hypoechoic oval mass with homogenous low-level internal echos that otherwise met the criteria for simple cysts (such as acoustic enhancement)*
4. *A micro lobulated or oval mass composed entirely of clustered microcysts with or without layering microcalcifications*
5. *Probable artificial posterior shadowing at the interface of fat lobules without any associated mass that changes its appearance on changing the angle of isolations*
6. *Architectural distortion thought to be due to postsurgical scarring*

FINDINGS THAT REQUIRES AN UPGRADE

1. *Irregular shape*
2. *Micro lobulated/angular/indistinct or spiculated margin*
3. *Nonparallel orientation (taller than wide)*
4. *Posterior acoustic shadowing*
5. *Intraductal mass*
6. *Intraductal extension*
7. *Micro calcification within the mass*
8. *Echo genic halo*
9. *Complex solid and cystic echogenicity*

REVIEWS AND COMMENTARY • EDITORIAL

Radiology

BI-RADS Category 3 Is a Safe and Effective Alternative to Biopsy or Surgical Excision

Linda Moy, MD

Dr Moy is professor of radiology at NYU. She is the senior deputy editor for *Radiology* and deputy editor of Breast Imaging for *Radiology*. Her research focuses on diagnostic oncologic imaging, with an emphasis on breast cancer. She is an NIH-funded investigator with applications in multiparametric breast MRI and artificial intelligence. She collaborates with the NYU Center for Data Science to investigate deep learning tools for multitask learning across modalities.

The American College of Radiology developed the Breast Imaging Reporting and Data System (BI-RADS) lexicon to standardize reporting of mammographic findings and their associated management (1). These terminologies and final assessment categories facilitate communication between radiologists and referring physicians and guide the

category 3 assessment for a mammographic finding. This number represents the largest cohort of women who had a mammographic finding categorized as BI-RADS category 3. Berg et al found that radiologists appropriately used BI-RADS category 3 for findings recalled from screening mammography (5). After 2 years, breast cancer was diagnosed in a total of 810 women. Therefore, the cancer yield was 1.86% and below the benchmark rate of 2%. Four hundred sixty-eight of 810 malignancies (57.8%) were diagnosed at or before 6 months, validating the role of short-interval follow-up.

A key result of the Berg et al study is that BI-RADS category 3 was safely used by private and academic radiologists. Specifically, it is important to observe that radiologists completed several tasks correctly. First, if a mammographic finding is assessed as a BI-RADS category 3 lesion during the initial evaluation, the corresponding management is short-interval follow-up (1). Until recently, discor-

A study by Berg et al. 45,202 women from 471 centers in the National Mammography Database found a 1.86% cumulative cancer yield for BI-RADS category 3, validating the appropriate use of this category. In that study, nearly 58% of the malignancies were diagnosed at or before the 6-month interval follow-up, underscoring the efficacy of this short-term follow-up recommendation.

BI-RADS CATEGORY 4 & 5

Category 4A can be used to direct cases that may be safely downgraded, by using possible supplemental technologies such as elastography or contrast-enhanced mammography (CEM) .

Categories 4C and 5 should not be considered for downgrade because the risk of malignancy is too high.

- *If percutaneous biopsy of a category 5 lesion reveals a benign histopathology, careful radiology-pathology correlation is required to determine if repeat image-guided biopsy or surgical biopsy is the optimal next step.*
-

BI-RADS 5: More than Cancer

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Abbreviation: BI-RADS = Breast Imaging Reporting and Data System

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The full digital presentation is available online.

Imaging evaluation of the breast relies on the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS), which offers a standard lexicon for describing, assessing, and managing breast imaging findings. The BI-RADS 5 assessment category is used when the likelihood of malignancy is estimated to be greater than or equal to 95% on the basis of imaging findings. However, according to Yao et al, the actual positive predictive value for a BI-RADS 5 assessment ranges from 78% to 97.5%. Hence, not all BI-RADS 5 lesions are malignant. There are several benign entities affecting the breast that may manifest with highly suspicious imaging features and BI-RADS 5 categorization. In this online presentation, we review the imaging features used in a BI-RADS 5 assessment, a range of benign entities that can mimic malignancy, the importance of radiologic-pathologic correlation, and the management of a discordant biopsy result.

There are specific imaging features of BI-RADS 5 malignancies depicted at mammography, US, and MRI. Typical mammographic

TEACHING POINTS

- A BI-RADS category 5 assessment is used when the likelihood of malignancy is believed to be greater than or equal to 95% on the basis of the imaging findings. Not all BI-RADS 5 lesions are found to be malignant.
- A benign percutaneous biopsy result for a BI-RADS 5 assessment warrants repeat percutaneous biopsy or excision.
- A variety of benign entities may be categorized as BI-RADS 5 because of suspicious imaging features. The most common BI-RADS 5 mimics are chronic and inflammatory mastitis, granulomatous mastitis, fat necrosis, complex sclerosing lesions, granular cell tumors, and infection.

Benign Entities Possibly Classified as BI-RADS 5

Atypical infection
Complex sclerosing lesion and radial scar
Fat necrosis
Fibromatosis or desmoid tumor
Granular cell tumor
Granulomatous mastitis
Inflammatory mastitis (autoimmune)
Lymphocytic (diabetic) mastopathy
Mastitis
Myofibroblastoma
Other benign entities (amyloidosis)

NONE MASS FINDING AT BREAST US

Nonmass Findings at Breast US: Definition, Classifications, and Differential Diagnosis

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Abbreviations: BI-RADS = Breast Imaging Reporting and Data System, DCIS = ductal carcinoma in situ, IDC = invasive ductal carcinoma, ILC = invasive lobular carcinoma

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A nonmass finding at US has been described as a discrete identifiable area of altered echotexture compared with that of the surrounding breast tissue that does not conform to a mass shape. Recognizing nonmass findings is important because breast cancer can manifest as such lesions, and US correlate findings for mammographic and breast MRI abnormalities may manifest as nonmass findings. The term *nonmass finding* is not part of the current Breast Imaging Reporting and Data System US terminology, and no standardized approach to classify and evaluate nonmass findings at US currently exists, despite the various classification systems proposed in the literature. There is also considerable overlap between the sonographic features of benign and malignant causes of nonmass findings. These limitations cause diagnostic difficulty in evaluating clinical significance and recommending appropriate management. The authors review the definitions and classification systems of US nonmass findings proposed in the literature and illustrate the sonographic features of nonmass findings to help radiologists identify them at US. A range of benign and malignant causes of nonmass findings are reviewed, and sonographic-histopathologic correlations of nonmass findings are discussed. Cases of breast MRI and mammographic findings that may manifest as US nonmass findings are presented. Radiologists

Term nonmass finding *is not part of the current Breast Imaging Reporting and Data System US terminology, and no standardized approach to classify and evaluate non mass findings at US currently exists*

Malignancy rates for nonmass findings reported in the literature as ranging from 10% to 54%.

- *The most common breast cancers identified as nonmass findings on US images were DCIS (11-19%) or ILC (13%).*

Nonmass findings have been described in the literature with various terms with varying descriptors, but all studies define a nonmass finding as a sonographic finding that does not conform to a mass shape (ie, nonconvex borders).

Table 1: Definitions of Nonmass Findings in the Literature

Study	Definition
Kim et al (2)	A hypoechoic area that is different from surrounding glands
Giess et al (4)	Identifiable discrete areas of altered echotexture compared with surrounding breast tissue depicted on orthogonal images and not conforming to a mass (convex) shape
Park et al (8)	A lesion visible in two orthogonal planes that cannot be characterized as a distinct mass because of a lack of conspicuous margin or shape
Ko et al (9)	A lesion showing ductlike hypoechoic structures with parallel orientation, geographic hypoechoic changes that differ from surrounding glandular tissue or the same area in the contralateral breast, or architectural distortion without a definitive mass
Wang et al (10)	A lesion on a conventional US image that does not meet the strict criteria of a mass
Shin et al (11)	A lesion with minimal or no mass effect, a focal heterogeneity distinguished from the adjacent normal breast parenchyma, or calcifications not associated with a mass; can have areas or spots of normal glandular tissue or fat interspersed with these lesions
Ko et al (12)	A lesion that is difficult to recognize as a mass, a lesion with minimal or no mass effect, or a focal heterogeneity distinct from the adjacent normal breast parenchyma, which may represent dilated ducts

categorize nonmass findings by echogenicity and distribution.

Associated features include tubular or ductal architecture, posterior shadowing, architectural distortion, and calcifications.

Table 2: Classification of Nonmass Findings, Patterns, and Distributions in the Literature

Study	Classifications
Kim et al (2)	Nonmass finding patterns: Mottled: a number of small hypoechoic islands of tissue Geographic: confluent hypoechoic areas without a cobblestone appearance that resemble geographic maps Indistinct: relatively uniform hypoechoic areas without clearly defined margins Nonmass distributions: Focal distribution: involving less than one quadrant of the breast Regional distribution: involving more than one quadrant of the breast
Giess et al (4)	Nonmass finding echotexture was categorized as predominantly (>50%) hypoechoic, predominantly hyperechoic, mixed hyperechoic and hypoechoic, or predominantly anechoic Associated findings: echogenic halo, shadowing, calcifications, architectural distortion, or ductal or tubular architecture
Park et al (8)	Distribution of nonmass findings: Focal: small confined area Linear-segmental: longitudinal or triangular area arrayed in a line or along the branches involving one or more ducts Regional: large geographic area of tissue that does not conform to a ductal or segmental distribution Associated features: calcifications, architectural distortion, and abnormal ductal changes
Wang et al (10)	Nonmass findings were classified as: Hypoechoic area (an area with low-level echoes) Hypoechoic area with sporadic or scattered microcalcifications Architectural distortion (an area with disordered organization structure compared to that of normal tissue) Solid echogenicity within a duct (solid lesion within a duct)
Ko et al (12)	Nonmass findings were classified into four types: Type 1: ductal hypoechoic area with ductal structures and parallel orientation, with and without calcifications Type 2: nonductal hypoechoic area visible as a confined asymmetry with an indistinct shape on two different projections, with and without calcifications Type 3: vague area of altered echotexture with associated architectural distortion Type 4: indistinct hypoechoic area with associated posterior acoustic shadowing
Japan Association of Breast and Thyroid Sonology (13)	Nonmass findings were classified as: Ductal dilatation Multivesicular pattern Low-echo area in the mammary gland (spotted or mottled low-echo areas, geographic low-echo areas, or low-echo areas with indistinct margins) Architectural distortion
Uematsu (14)	Nonmass findings were classified as: Ductal hypoechoic area: ductlike structure with parallel orientation Single ductal hypoechoic area Multiple ductal hypoechoic areas Nonductal hypoechoic area: an area with an indistinct shape at different projections but lacking convex outer borders and conspicuity Focal nonductal hypoechoic area: a nonoriented hypoechoic area occupying a volume of less than one quadrant of the breast Segmental nonductal hypoechoic area: a triangular or cone-shaped hypoechoic area with the apex pointing to the nipple Associated findings: calcifications and architectural distortion Multiple, bilateral, and diffuse hypoechoic areas are considered normal variations or changes caused by hormonal influences unless there is a corresponding palpable abnormality

ECHOGENICITY OF NONMASS FINDINGS

- *Based on visual analysis*

1. *predominantly (>50%) hypoechoic*
2. *predominantly hyperechoic*
3. *mixed hyperechoic and hypoechoic*
4. *predominantly anechoic*

The malignancy rate by echotexture of non- mass findings is not known.

According to the BI-RADS atlas, the echotexture of masses is not predictive of a histopathologic finding

DISTRIBUTION OF NONMASS FINDINGS

1. *Focal: a small confined area*

2. *linear-segmental: a longitudinal or triangular area arrayed in a line along a ductal distribution.*

3. *regional : a large geographic area not conforming to a ductal or segmental distribution*

Linear-segmental distribution was more commonly depicted in malignant nonmass findings than in benign lesions. (45%)

CORRELATIONS WITH HISTOPATHOLOGIC FINDINGS AND BENIGN AND MALIGNANT HISTOLOGIC FINDINGS

Associated Feature	Histopathologic Entities
Calcifications	IDC, DCIS, atypical ductal hyperplasia, lobular carcinoma in situ, fibroadenoma, radial scar, and tubular adenoma
Ductal or tubular architecture	IDC, DCIS, intraductal papilloma, atypical ductal hyperplasia, atypical lobular hyperplasia, fibrocystic changes, and ductal ectasia
Posterior acoustic shadowing	Invasive carcinoma, postoperative scar, complex sclerosing lesion, and fibrous or dense breast tissue
Architectural distortion	Invasive carcinoma, DCIS, fibrosis, sclerosing adenosis, fat necrosis, and radial scar and/or complex sclerosing lesion

CALCIFICATIONS

Calcification on US images have been reported to be more than three times more likely to be malignant than those that were not depicted, possibly because calcifications associated with benign tissue may be obscured by echogenic breast parenchyma.

TUBULAR OR DUCTAL ARCHITECTURE

While there are benign causes of nonmass findings with associated tubular or ductal architecture, ductal changes may represent the ductal spread of cancer cells and can be visualized in DCIS.

The enlargement of the ducts in DCIS has been ascribed to tumor cells or necrosis within the duct lumen, periductal lymphocytic reaction, or periductal desmoplasia

POSTERIOR ACOUSTIC SHADOWING

Posterior acoustic shadowing may indicate pathologic changes inciting desmoplastic reaction that can attenuate the ultrasound beam and are described in both benign and malignant conditions

ARCHITECTURAL DISTORTION

Architectural distortion can be attributed to pathologic changes distorting ducts within the adjacent fibro glandular tissue or straightening nearby Cooper ligaments.

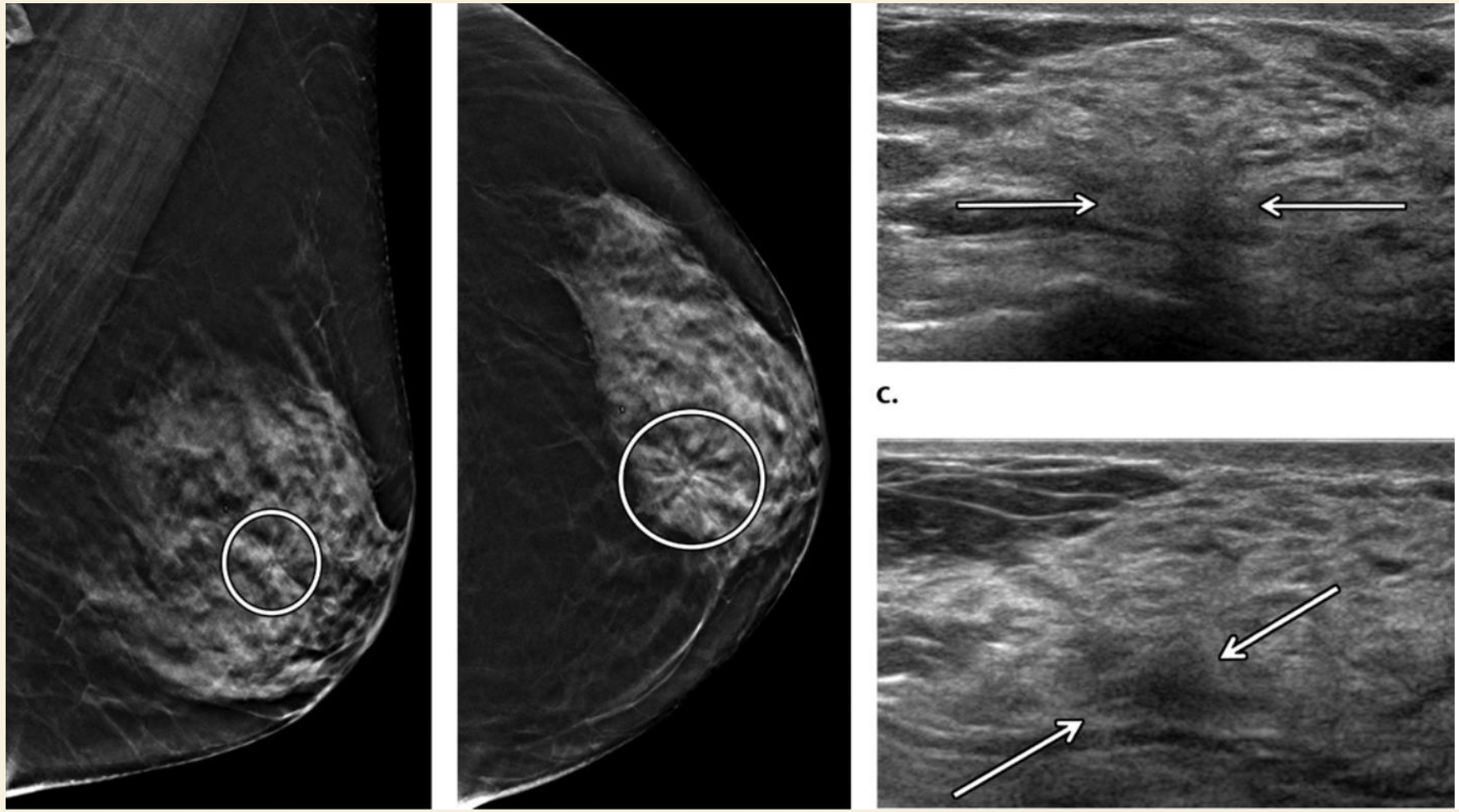
Architectural distortion is a more frequent associated feature of nonmass findings in malignant lesions than in benign lesions

CORRELATION BETWEEN BREAST US AND MAMMOGRAPHIC FINDINGS

Accurate identification of a US correlate for mammographic abnormalities is an important component of diagnostic evaluation.

Mammographic lesions that most often appear as nonmass findings on US images include calcifications, a focal or developing asymmetry, and architectural distortion

- *Park et al reported that malignant nonmass findings at US are more often associated with mammographic abnormalities than are benign nonmass findings, as 84% of malignant nonmass findings had corresponding mammographic abnormalities, compared with 40% in benign non-mass findings in their study.*

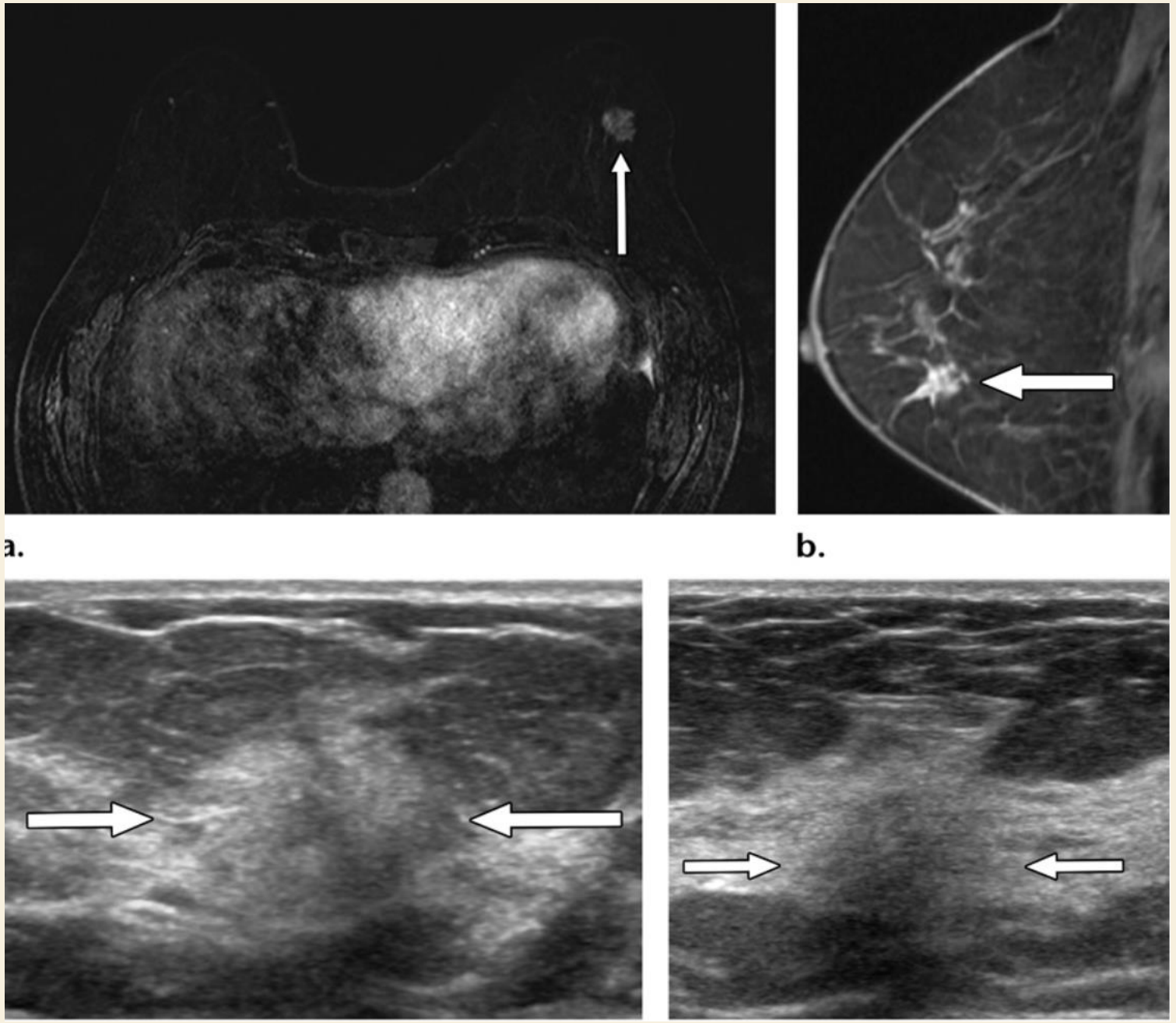


Invasive carcinoma with ductal and lobular features and DCIS

CORRELATION BETWEEN BREAST US AND MRI FINDINGS

40% of nonmass findings at US have corresponding enhancing lesions at MRI, and of these findings, 97% were nonmass enhancement at MRI.

95% of malignant nonmass findings at US showed non- mass enhancement at MRI



ILC.

Reassessment and Follow-Up Results of BI-RADS Category 3 Lesions Detected on Screening Breast Ultrasound

Eun Young Chae[1]
Joo Hee Cha
Hee Jung Shin
Woo Jung Choi
Hak Hee Kim

OBJECTIVE. The purpose of this study is to determine the frequency and the malignancy rate of BI-RADS category 3 lesions detected on screening breast ultrasound and to reassess whether they satisfied the requirements of the American College of Radiology Imaging Network (ACRIN) 6666 protocol.

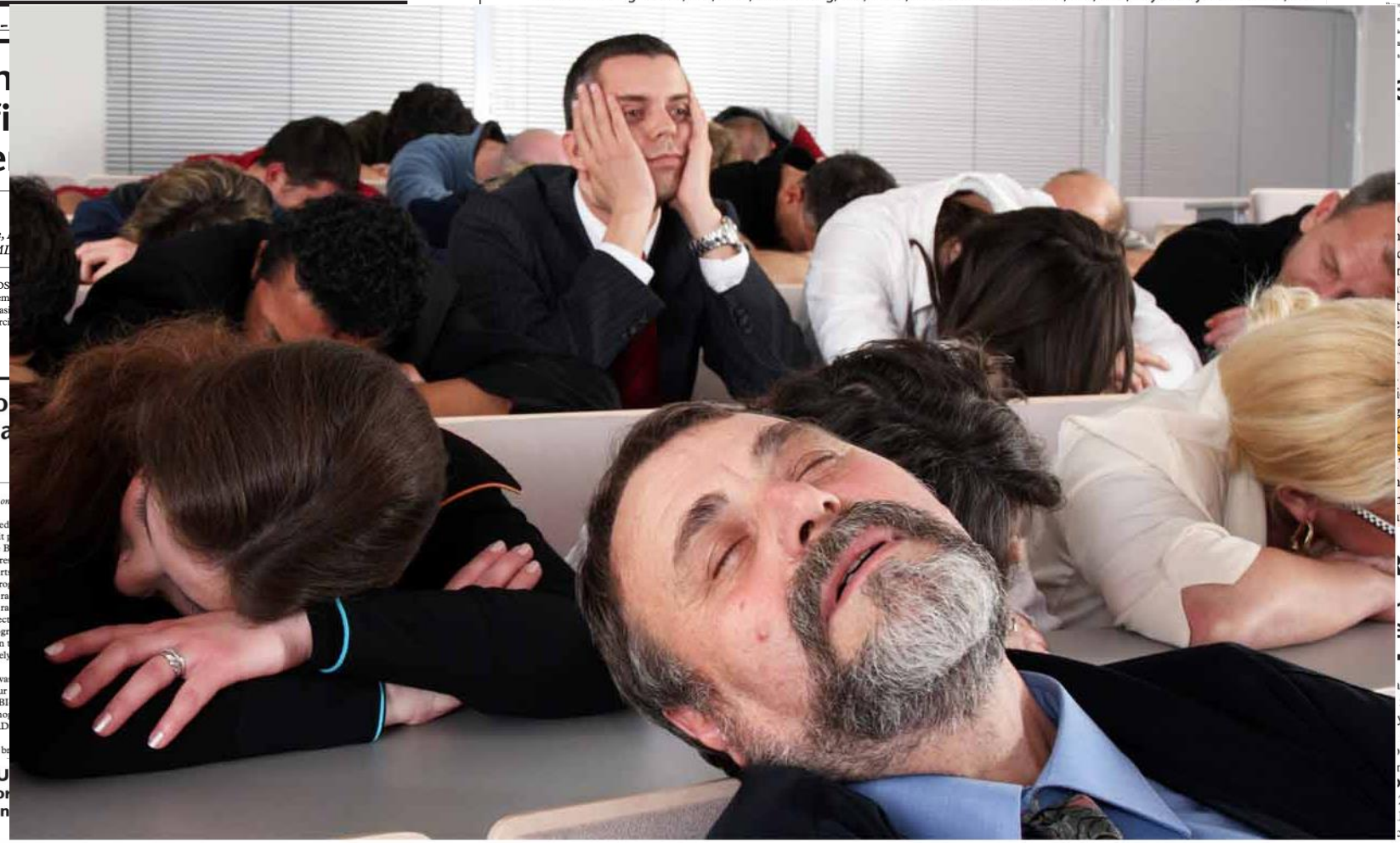
MATERIALS AND METHODS. Of 28,796 asymptomatic women who underwent screening mammography during 2 years, 12,187 underwent additional ultrasound as part of the screening. Patients for whom BI-RADS category 3 lesions were seen on the ultrasound were selected. We reviewed the initial ultrasound showing BI-RADS category 3 lesions and mammograms. We also investigated the clinical outcome of these lesions using the reference standard of a combination of pathologic analysis and follow-up for at least 24 months.

RESULTS. The frequency of BI-RADS category 3 lesions detected on screening ultrasound was 14.6% (1783/12,187). Of the 1164 patients with a follow-up duration of at least 24 months or whose lesions were biopsied, eight were eventually proven to have malignancy (0.7%). The malignancy rate was 2.2% (4/184) for patients with abnormal mammograms and 0.4% (4/980) for those with normal mammograms. When the ACRIN 6666 protocols were strictly applied, 225 (19.3%) lesions were retrospectively recategorized as BI-RADS category 4 (n = 12) or category 2 (n = 213). All detected malignancies were early breast cancers with no lymph node metastasis.

CONCLUSION. Although the frequency of ultrasound BI-RADS category 3 lesions is considerably high (14.6%), the malignancy rate is very low (0.7%), especially in patients with a normal mammogram. Therefore, with BI-RADS category 3 assessment, careful evaluation

Current Status and Future of BI-RADS in Multimodality Imaging, From the *AJR* Special Series on Radiology Reporting and Data Systems

Mohammad Eghtedari, MD, PhD[1], Alice Chong, MD, MHCI, Rebecca Rakow-Penner, MD, PhD, Haydee Ojeda-Fournier, MD



Assessment and Management of Challenging BI-RADS Category 3 Mammographic Lesions[1]

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Breast Imaging Reporting and Data System (BI-RADS) category 3 lesions are probably benign by definition and are recommended for short-interval follow-up after a diagnostic workup has been completed. Although the original lexicon-derived BI-RADS category 3 definition applied to lesions without prior imaging studies (when stability could not be determined), in clinical practice, many lesions with prior images may be assigned to BI-RADS category 3. Although the BI-RADS fifth edition specifically delineates lesions that are appropriate for categorization as probably benign, it also specifies that the interpreting radiologist may use his or her discretion and experience to justify a "watchful waiting" approach for lesions that do not meet established criteria. Examples of such

Abbreviations: BI-RADS = Breast Imaging Reporting and Data System, CC = craniocaudal, IDC = invasive ductal carcinoma, MLO = mediolateral oblique

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ew of Changes Fifth Edition[1]

oped in 1993, the American College of Radiology g Reporting and Data System (BI-RADS) lexicon dardize breast imaging reports, improve communicarring physicians, and provide a quality assurance tool. ited BI-RADS fifth edition consolidates, improves, the lexicon for mammography, breast ultrasonography ast magnetic resonance (MR) imaging. The new edased the number of imaging examples to nearly 600. R imaging lexicon is significantly expanded since it in the fourth edition. New terms have been added icon to reflect technologic advances. Minor but imges have been made to the mammography section. descriptors in the lexicon are now consolidated into s: benign and suspicious. The controversial "interme-" grouping has been eliminated, and a table in the arizes the literature supporting the recommendation calcifications. New descriptors such as "developing re illustrated, and abstracts are provided to reference

BI-RADS Terminology fo mography Reports: Wha dents Need to Know

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Maria B. Orruma, MD
Carolina Hadad, MD
Yesenia Bermúdez Cano, MD
Roberto Secco, MD
Andrea Cernadas, MD

The full digital presentation is available on

Mammography is the most widely used early detection of breast cancer, and it reducing breast cancer mortality. The Data System (BI-RADS) lexicon is pre tion tool used in mammography reports established breast cancer screening pro is the compass that effectively guides ra daily practice, and it is important for ra stand the lexicon so that they can effect imaging findings depicted at mammogr tion describes the terminology used in help radiologists and trainees effectively improve patient care.

The BI-RADS lexicon in general wa system. Since its creation in 1993, four in 1995, 1998, 2003, and 2013. The BI quality assurance system used to homo mographic screenings, but the BI-RAD for use with US and MRI.

The BI-RADS lexicon categorizes br

Abbreviation: BI-RADS = Breast Imaging Reporting and Data System

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ADS Assessment ubdivisions for east MRI

mmography and ultrasound subdivides category 4 assess- into categories 4A (> 2% to ≤ 10%), 4B (> 10% to ≤ 50%), y 4 is not subdivided for breast MRI because of a paucity study is to determine the utility of categories 4A, 4B, and sitive predictive values (PPVs) and comparing them with nancy for mammography and ultrasound.

DS. All screening breast MRI examinations performed 2013, were included in this study. We identified in medical I BI-RADS categories, including category 4 subdivisions, ctice. Benign versus malignant outcomes were determined by pathologic analysis, findings from 12 months or more clinical or imaging follow-up, or a combination of these methods. Distribution of BI-RADS categories and positive predictive value level 2 (PPV2; based on recommendation for tissue diagnosis) for categories 4 (including its subdivisions) and 5 were calculated.

RESULTS. Of 860 screening breast MRI examinations performed for 566 women (mean age, 47 years), 82 with a BI-RADS category 4 assessment were identified. A total of 18 malignancies were found among 84 category 4 and 5 assessments, for an overall PPV2 of 21.4% (18/84). For category 4 subdivisions, PPV2s were as follows: for category 4A, 2.5% (1/40); for category 4B, 27.6% (8/29); for category 4C, 83.3% (5/6); and for category 4 (not otherwise specified), 28.6% (2/7).

CONCLUSION. Category 4 subdivisions for MRI yielded malignancy rates within BI-RADS–specified ranges, supporting their use for benefits to patient care and more meaningful practice audits.

Keywords: BI-RADS category 4, breast MRI

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Reassessment and Follow-U Results of BI-RADS Categor Lesions Detected on Screen Breast Ultrasound

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