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REVIEW / *Breast Imaging*

BI-RADS® fifth edition: A summary of changes

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Abstract The Breast Imaging Reporting and Data System (BI-RADS®) is a standardized system of reporting breast pathology as seen on mammogram, ultrasound, and magnetic resonance imaging. It encourages consistency between reports and facilitates clear communication between the radiologist and other physicians by providing a lexicon of descriptors, a reporting structure that relates assessment categories to management recommendations, and a framework for data collection and auditing. This article highlights the changes made to the BI-RADS® atlas 5th edition by comparison with its predecessor, provide a useful resource for a radiologist attempting to review the recent changes to the new edition, and serve as a quick reference to those who have previously become familiar with the material.

The Breast Imaging Reporting and Data System (BI-RADS®) is a standardized system of reporting breast pathology encountered on mammography, ultrasound, and magnetic resonance imaging (MRI). This structured system encourages consistency between reports and facilitates clear communication between the radiologist and other physicians by providing a lexicon of descriptors, a reporting structure that relates assessment categories to management recommendations, and a framework for data collection and auditing [1—3]. Published by the American College of Radiology (ACR), the initial edition of BI-RADS® was created in 1993 [1]. The second, third, and fourth editions were released in 1995, 1998,

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and 2003 respectively [2]. Each edition was built on previous work by clarifying previous terms with an aim toward risk stratification. Furthermore, the inclusion of ultrasound and MRI descriptors promoted congruence across modalities. Artist renderings of pathology, which appeared in the third edition of the lexicon also assisted learning and understanding the framework.

The hiatus between the 4th and 5th lexicon allowed several questions pertaining to the reproducibility of assessment and frequency of certain descriptor use to be evaluated and published. The 5th edition of BI-RADS® released in 2013 ushered in numerous changes geared toward these goals. These changes include multiple new descriptors added in recognition of the increasing risk of malignancy an image finding represents, historic descriptors removed due to underutilization or redundant application, and name changes to pre-existing descriptors to align descriptions across the three imaging modalities [1,2]. Moreover, newer technology such as shear-wave elastography has been incorporated into the descriptors. Finally, images acquired directly from mammography, ultrasound, and MRI replace artist rendering to demonstrate pathology in the 5th edition.

The purpose of this paper was to summarize the changes introduced within the newest edition of BI-RADS®. It is the hope of the authors that this review will provide a useful resource for a radiologist attempting to review the recent changes to the new edition and serve as a quick reference to those who have previously become familiar with the material.

Mammography

Breast composition

Breast composition or density is a comparison of the relative amounts of fat *versus* fibroglandular tissue in the breast. In the 4th edition of lexicon, composition was associated with percent values of fibroglandular tissue as assessed by the radiologist.

The terms available to describe breast composition on a mammogram no longer include percentage quartiles (Table 1). Radiologists' assessment of numeric quartiles has consistently been mismatched with automated volume calculations particularly as fibroglandular volume increases [4].

Table 1 Summary of changes within mammography between the BI-RADS® 4th and 5th editions [3].

	4th edition	5th edition
Breast composition	Previously based on percentages (A) Almost entirely fat (less than 25%) (B) Scattered fibroglandular densities (25—50%) (C) Heterogeneously dense (50—75%) (D) Extremely dense (greater than 75%)	Percentages removed: (A) The breasts are almost entirely fatty (B) There are scattered areas of fibroglandular density (C) The breasts are heterogeneously dense, which may obscure small masses (D) The breasts are extremely dense, which lowers the sensitivity of mammography
Masses	Historically masses: shape: lobular	Removed in the 5th edition
Calcifications: typically benign: rim and lucent-centered calcifications	Historically rim, eggshell or lucent-centered calcifications	Renamed to calcifications: typically benign: rim
Calcifications: suspicious morphology	Historic categories removed: intermediate concern, suspicious calcifications and higher probability malignancy	Now a single category calcifications: suspicious morphology
Asymmetries	Historically special cases: global asymmetry and focal asymmetry	Asymmetries: (A) Asymmetry (B) Global asymmetry (C) Focal asymmetry (D) Developing asymmetry
Intramammary lymph node and solitary dilated duct categories	Historically located within special cases	New separate categories
Skin lesion	Historically located within associated features	New separate category
Location of lesion: distance from the nipple	Historically only depth was available to describe distance from the nipple	New in 5th edition
Use of radiopaque markers		Definition of use expanded
Assessment categories 3, 4, and 5		Assigned after diagnostic workup completed (not appropriate for screening examinations)

The numerical values previously associated with them were also removed to avoid confusion with the overall assessment categories. The descriptions within the 5th edition range from least to most dense, and are based purely on the radiologist's visual assessment of the amount of fibroglandular density, again based on rough quartile distribution (Fig. 1; Table 1).

Masses

Mass shape classification in the BI-RADS® 5th edition consists of ''oval'', ''round'', and ''irregular''. The historic shape descriptor of ''lobular'' has been removed from the lexicon. This is due to the possible confusion that could arise from the term ''lobular'' applied to define the shape of a mass which normally conveys a benign etiology and the margin descriptor ''microlobulated'' which implies a suspicious finding. Per the new lexicon, a mass with two or three undulations may be described as ''oval'' and the margin descriptors of ''circumscribed'', ''obscured'', ''microlobulated'', ''indistinct'', and ''spiculated'' may be used to describe margins as applicable.

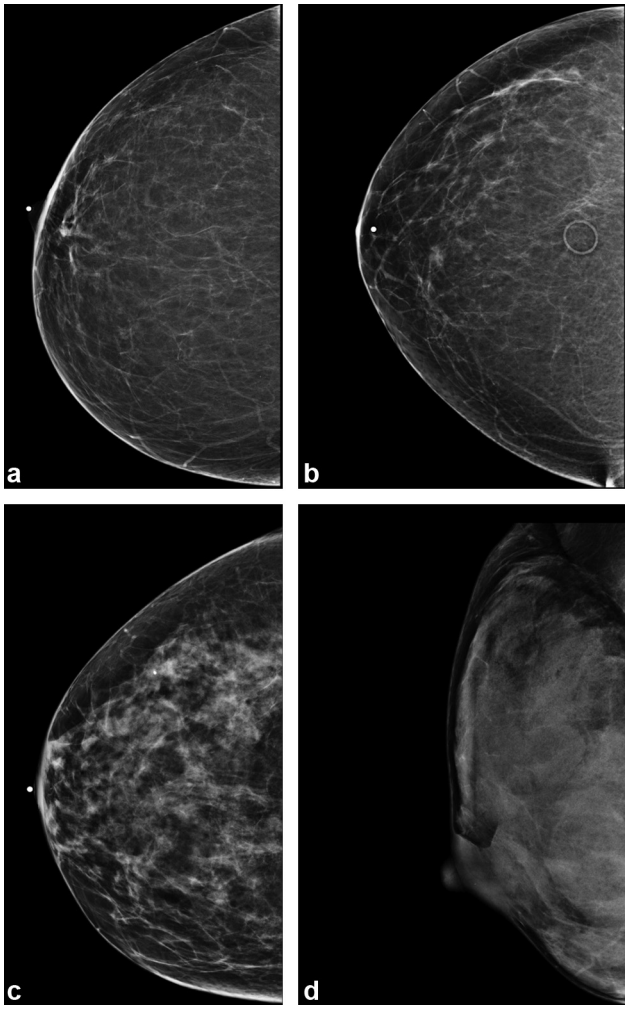

Figure 1. Craniocaudal (CC) views from screening mammogram obtained in different women. (a) 54-year-old woman with almost entirely fatty breast. (b) 55-year-old woman with scattered areas of fibroglandular density. (c) 57-year-old woman with heterogeneously dense breast. (d) 50-year-old woman with extremely dense breast composition.

Typically benign calcifications

In the new BI-RADS® 5th edition lexicon, typically benign calcification morphology includes ''skin'', ''vascular'', ''coarse or popcorn-like'', ''large rod-like'', ''round'', ''rim'', ''dystrophic'', ''milk of calcium'', and ''suture''. The historic descriptors ''eggshell'' and ''lucent-centered'' have been removed and consolidated into the single calcification morphology descriptor of ''rim'' to describe calcium surrounding a lucent center. The aim of this change was to simplify reporting as all three appearances are typically benign.

Calcifications with suspicious morphology

In the 4th edition, calcification morphology was examined in three main subcategories: benign, intermediate and suspicious. In the 5th edition, suspicious category morphology replaces two previous categories ''intermediate concern, suspicious calcifications'' and ''higher probability malignancy''.

In the new BI-RADS® 5th edition lexicon, the typically suspicious calcification morphology includes ''amorphous'', ''coarse heterogeneous'', ''fine pleomorphic'', and ''fine linear or fine-linear branching''. The change was brought about after multiple studies concluded the chance of malignancy was high enough to warrant biopsy [1,5—8]. Currently ''amorphous'', ''coarse heterogeneous'', and ''fine pleomorphic'' calcifications are thought to represent a lower risk of malignancy and should be assigned to category 4B as opposed to ''fine linear or fine-linear branching'' calcifications which should be assigned to category 4C (Fig. 2).

Asymmetries

Asymmetries are usually an artifact created from the summation of overlying tissue. The previous BI-RADS® special cases descriptors ''global asymmetry'' and ''focal asymmetry'' have been significantly expanded in the current edition. A new category for asymmetries has been created with the following descriptors now available: ''asymmetry'',

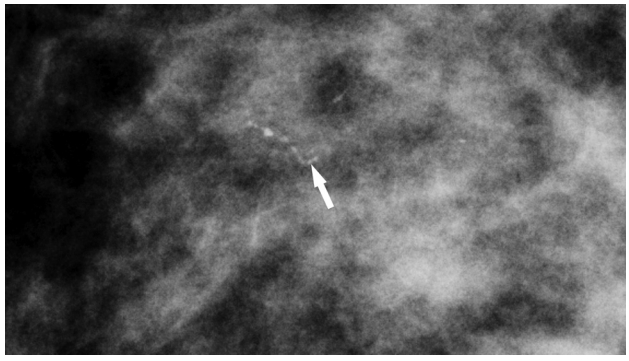

Figure 2. A 56-year-old woman undergoing screening mammogram. Zoomed craniocaudal view of the right breast depicts fine linear calcifications (arrow). Stereotactic breast biopsy revealed ductal carcinoma *in situ*, with high nuclear grade.

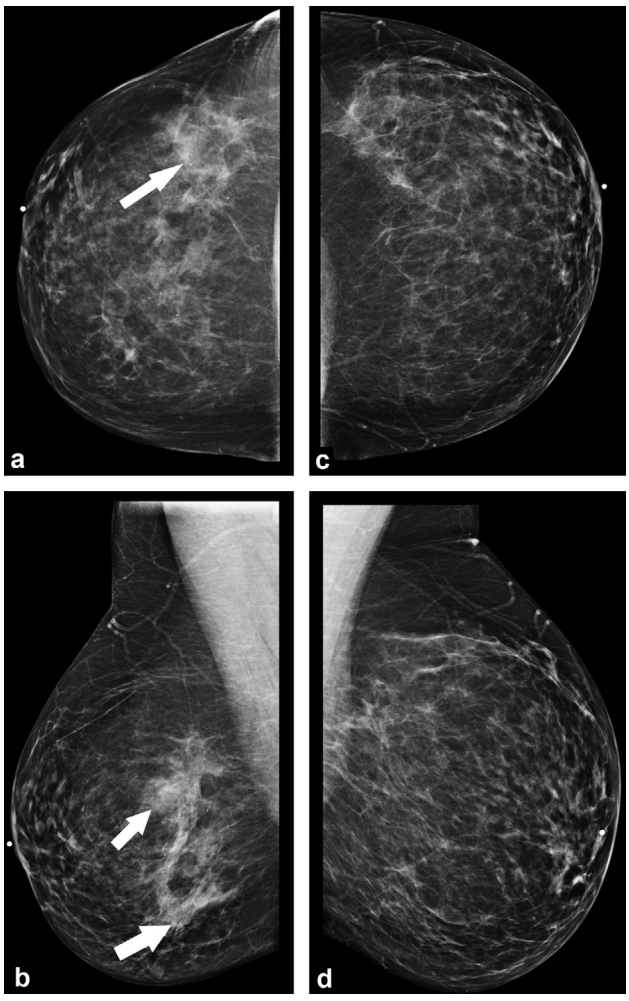

Figure 3. A 42-year-old woman undergoing diagnostic mammogram with personal history of lobular carcinoma *in situ* in the right breast. (a) Right craniocaudal (CC) view; (b) right mediolateral oblique (MLO) view; (c) left CC view; and (d) left MLO view demonstrate focal asymmetry within the right breast lower outer quadrant (arrows). Follow-up magnetic resonance-guided biopsy yielded lobular carcinoma *in situ* and pseudoangiomatous stromal hyperplasia.

''global asymmetry'', ''developing asymmetry'', and ''focal asymmetry'' (Fig. 3). The ''developing asymmetry'' descriptor was added to the lexicon as this finding has been associated with a risk of malignancy high enough to warrant recall and potential biopsy [9].

Intramammary lymph nodes

In the 4th edition of the lexicon, a descriptor for an intramammary lymph node resided within the ''special cases'' category. A new separate category for ''intramammary lymph node'' has been created in the 5th edition.

Skin lesions

Previously in the 4th edition, the descriptor ''skin lesion'' resided within the ''associated features'' category. In the current lexicon a separate category has been created. These lesions should be marked by the mammography technologist if apparent at time of examination.

Solitary dilated duct

A solitary dilated duct was previously described under the ''special cases'' category in the 4th edition (Fig. 4). Although rare, a ''new findings'' category has been created in the current lexicon due to the increasing risk of malignancy the finding represents [10].

Descriptors for location of lesion

The report of lesion location is encouraged to follow this syntax: laterality (referring to the left or right breast); quadrant and clock face; depth (anterior, middle, or posterior); and, distance from the nipple. This expanded description of lesion location assists comparing findings across modalities. Note that retroareolar refers to a central lesion within the anterior depth.

Use of radiopaque markers

The use of radiopaque markers has been expanded upon in the 5th edition. The use now discusses application of markers for skin and palpable lesions. The 5th edition also recommends each facility adopt a policy governing the type of maker used for each lesion and a method of detailing what the marker represents as an image annotation or description within the final report.

Mammography BI-RADS® assessment categories

Some clarification on the appropriate use of BI-RADS® 3 assessment category has been undertaken in the 5th edition. Specifically, in the context of a screening-detected abnormality, BI-RADS® assessment category 3 should be reserved for lesions that have been fully evaluated in the diagnostic setting and are inappropriate for screening examinations. Similarly, assessment categories 4 and 5 should also be reserved until after the diagnostic workup of a lesion has been completed.

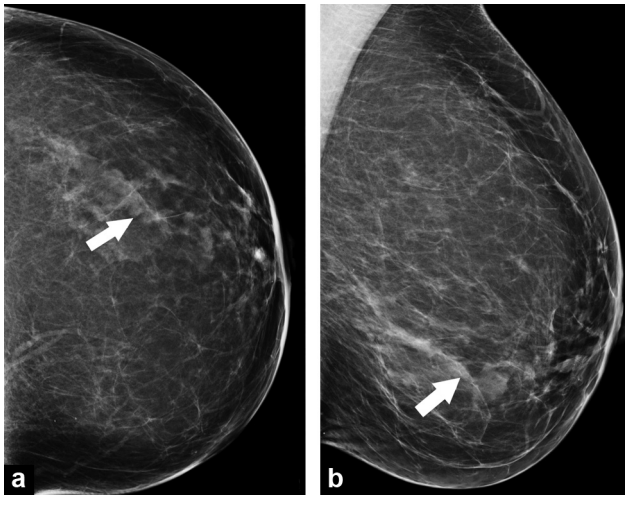

Figure 4. A 58-year-old woman undergoing screening mammogram without personal history of cancer. (a) Left craniocaudal view and (b) left mediolateral oblique view demonstrate a solitary, dilated duct (arrows) stable for several years.

Ultrasound

General considerations

A general consideration subsection has been added to the 5th edition of BI-RADS®. This subsection includes information involving breast anatomy, image quality, labeling and measurement, as well as documentation.

Masses

The 5th edition of the BI-RADS® provides mass descriptors examined under ultrasound of ''shape'', ''orientation'', ''margin'', ''echo pattern'', and ''posterior features'' (Table 2). The unification of mass descriptors across mammography and magnetic resonance examinations assists in aligning findings identified on separate modalities. Furthermore, it helps to eliminate confusion of benign and malignant mass descriptors across multiple imaging types.

To this end, the historic descriptor of ''lesion boundary'' has been removed from the new version of the lexicon. This is in part based on the low diagnostic value of the presence of an echogenic transition zone or echogenic rim *versus* an abrupt margin transition zone of a mass to discriminate benign and malignant pathology. The lexicon provides margin descriptors of ''circumscribed'', ''indistinct'', ''angular'', ''microlobulated'', and ''spiculated'' for mass margins identified sonographically.

Finally, the historic descriptor of ''posterior acoustic features'' has been renamed in the new edition to ''posterior features'' as mentioned above. The terms available to describe these features of a mass in the 5th edition are ''no

Table 2 Summary of changes within ultraound between the BI-RADS® 4th and 5th editions [3].

	4th edition	5th edition
General considerations subsection	N. S.	(A) Breast anatomy (B) Image quality (C) Labeling and measurement (D) Documentation
Lesion boundary of masses	Lesion boundary	Lesion boundary removed from 5th edition
Posterior features of masses	Historically termed: posterior acoustic features	New term: posterior features
Macrocalcifications	Historically under calcifications	Removed from 5th edition
Intraductal calcifications	N. S.	Created under calcifications
Surrounding tissue attributes now found under associated features	Surrounding tissue: (A) Architectural distortion (B) Duct changes (C) Edema (D) Skin thickening (E) Skin retraction	Associated features: (A) Architectural distortion (B) Duct changes (C) Edema (D) Skin thickening (E) Skin retraction
Cooper's ligament changes	Historically under surrounding tissue	Now described under architectural distortion
Vascularity under associated features	Historically vascularity included: (A) Not present or not assessed (B) Present in lesion (C) Present immediately adjacent to lesion (D) Diffusely increased vascularity in surrounding tissue	Vascularity lexicon now under associated features: (A) Absent (B) Internal vascularity (C) Vessels in rim
Elasticity assessment	N. S.	Created under associated features: elasticity assessment: (A) Soft (B) Intermediate (C) Hard
Special cases	N. S.	Special cases created: (A) Simple cyst (B) Postsurgical fluid collection (C) Fat necrosis
Vascular abnormalities	N. S.	Special cases: vascular abnormalities: (A) Arteriovenous malformation/pseudoaneurysms (B) Mondor disease

N.S.: information not previously specified.

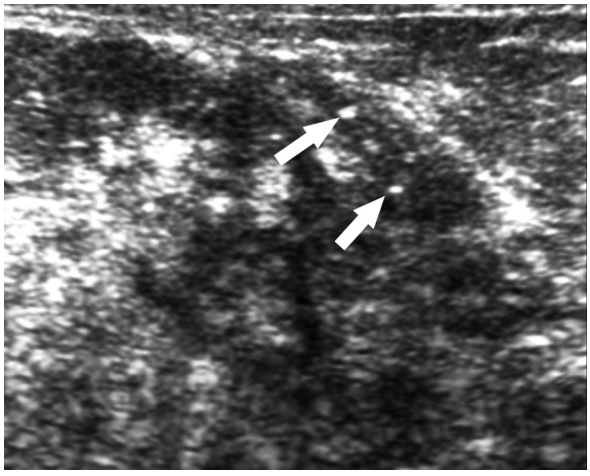

Figure 5. A 77-year-old woman with remote history of invasive and *in situ* ductal carcinoma. Cropped grayscale ultrasound image depicts dilated ducts extending from the nipple with intraductal calcifications (arrows). Ultrasound-guided vacuum-assisted core biopsy of the calcifications yielded high-grade ductal carcinoma *in situ* with comedonecrosis.

posterior features'', ''enhancement'', ''shadowing'', and ''combined pattern''.

Calcifications

The lexicon added ''intraductal calcifications'' in the 5th edition and removed the historic descriptor ''macrocalcifications'' (Fig. 5). ''Calcifications in a mass'' and ''calcifications outside of a mass'' are also available to describe calcifications visible during an ultrasound examination.

Reorganization of surrounding tissue descriptors

Multiple terms historically located within the ''surrounding tissue'' category have been reorganized under ''associated features''. These descriptors include ''architectural distortion'', ''duct changes'', ''edema'', ''skin retraction'' and ''skin thickening''. Note that ''architectural distortion'' describes various effects upon surrounding tissue including changes involving Cooper's ligaments which was historically located under the surrounding tissue category (Fig. 6). This change aligns the lexicon in a similar manner to the descriptors available within mammography. However, these findings are currently described in MRI as non-mass features.

Vascularity

Terms related to vascularity were historically ''not present or not assessed'', ''present in lesion'', ''present immediately adjacent to lesion'', and ''diffusely increased vascularity in surrounding tissue''. Findings related to vascularity have now been streamlined within the 5th edition under the associated features category as being ''absent'', ''internal vascularity'', and ''vessels in rim''.

Elasticity assessment

The evaluation of tissue stiffness has been a developing area of research related to breast cancer to augment morphologic description. Several studies have demonstrated promising results in supplementing an ultrasound examination with compression elasticity imaging to help differentiate between benign and malignant lesions [11—13]. New descriptors under the associated features category for elasticity assessment of ''soft'', ''intermediate'', and ''hard'' have been created to further this goal.

Descriptors for special cases

Descriptors under the special cases category remain available from the previous edition to describe a unique diagnosis or finding. These terms include: ''clustered microcysts'', ''complicated cyst'', ''mass in or on skin'', ''foreign body including implants'', ''lymph nodes intramammary'', and ''lymph nodes axillary''. Note that a complicated cyst refers to a cyst with internal debris visible as homogeneous internal low level echoes.

New descriptors are now available under special cases in the 5th edition. The terms ''simple cyst'', ''postsurgical fluid collection'', and ''fat necrosis'' have been created as well as descriptors related to vascular abnormalities of ''arteriovenous malformations (AVM)/pseudoaneurysms'' and ''Mondor disease'' which can be used to describe these findings with a pathognomonic diagnosis (Fig. 7).

MRI

Amount of fibroglandular tissue

The amount of fibroglandular tissue is now described in a similar manner as within mammography. The new

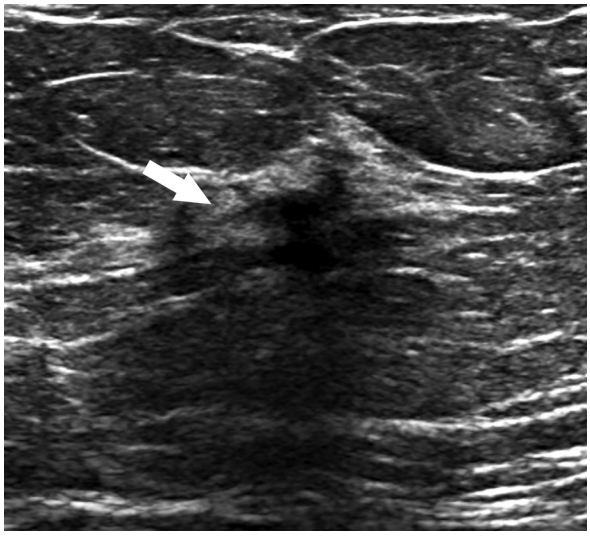

Figure 6. A 57-year-old woman with family history of breast cancer and developing asymmetry on recent mammogram. Cropped grayscale ultrasound image demonstrates an area of architectural distortion (arrow). Follow-up ultrasound-guided core biopsy revealed invasive lobular carcinoma.

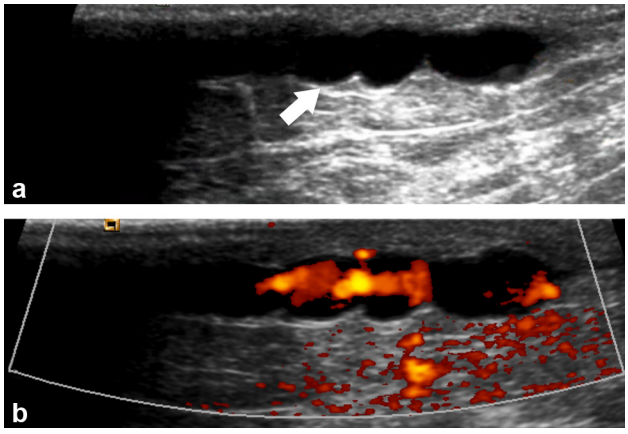

Figure 7. A 59-year-old woman with recently diagnosed ductal carcinoma *in situ* of the right breast. (a) Cropped grayscale ultrasound image demonstrates a dilated non-compressible periareolar superficial vein (arrow); (b) Cropped grayscale ultrasound image with power Doppler applied demonstrates decreased internal flow compatible with superficial thrombophlebitis or Mondor disease.

descriptors of ''almost entirely fat'', ''scattered fibroglandular tissue'', ''heterogeneous fibroglandular tissue'', and ''extreme fibroglandular tissue'' are now employed to describe breast composition (Fig. 8; Table 3).

Background parenchymal enhancement

New terms to quantify the amount of background parenchymal enhancement present on contrast enhanced MRI studies are available. Quantifying the level of enhancement is important as the sensitivity of detecting malignancy has found to decrease as the level of background parenchymal enhancement increases [14]. The level of enhancement of the fibroglandular tissue should be evaluated on the first post-contrast image and may be described as ''minimal'', ''mild'', ''moderate'', or ''marked''.

''Symmetric'' and ''asymmetric'' descriptors of non-mass-like enhancement are also found within the category of background parenchymal enhancement. These terms have historically been located under a separate finding of non-mass enhancement.

Focus descriptor

Foci has been removed from the historic descriptor focus-foci as new descriptors of background parenchymal enhancement detailed previously are now available. A focus of enhancement should have no correlating findings on pre-contrast images before applying this descriptor.

Mass shape

A mass identified during a magnetic resonance examination can be given an ''oval'', ''round'', or ''irregular'' shape descriptor. The historic ''lobular'' descriptor was removed as it served a redundant role with the ''oval'' descriptor which includes lobulated masses. This change is among many to the descriptors to characterize a breast mass that were implemented to align them with the terminology utilized in other modalities.

Mass margin

The margin of a mass may be described as ''circumscribed'', ''irregular'', or ''spiculated''. The historic ''smooth'' descriptor has been renamed to ''circumscribed''.

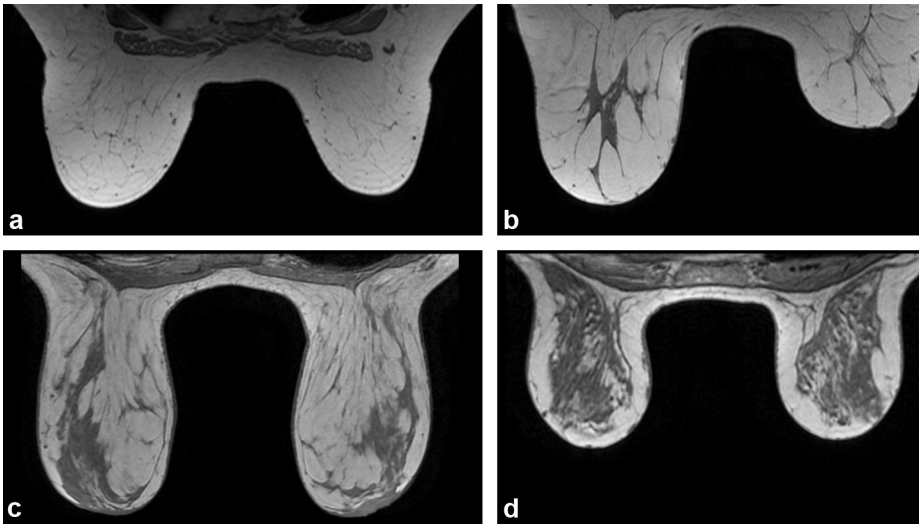

Figure 8. T1-weighted magnetic resonance images obtained in the transverse plane in four different women. (a) A 77-year-old woman with known breast cancer receiving an MRI for staging purpose. T1-weighted magnetic resonance image shows fibroglandular tissue with almost entirely fat; (b) a 37-year-old woman at high risk for breast cancer receiving a screening MRI. T1-weighted magnetic resonance image shows scattered fibroglandular tissue; (c) a 35-year-old woman obtaining MRI due to right nipple discharge and lack of ultrasound correlate. T1-weighted magnetic resonance image demonstrates heterogeneous fibroglandular tissue; (d) a 59-year-old woman receiving a screening MRI. T1-weighted magnetic resonance image shows extremely dense fibroglandular tissue.

Table 3 Summary of changes within MRI between the BI-RADS® 4th and 5th editions [3].

	4th edition	5th edition
Breast composition	N. S.	Amount of fibroglandular tissue (A) Almost entirely fat (B) Scattered fibroglandular tissue (C) Heterogeneous fibroglandular tissue (D) Extreme fibroglandular tissue
Background parenchymal enhancement	N. S.	(A) Minimal (B) Mild (C) Moderate (D) Marked
Non-mass-like enhancement: symmetric or asymmetric	Historically under non-mass-like enhancement	Now under background parenchymal enhancement
Focus	Historically focus-foci	Foci (of focus-foci) removed
Shape: lobular	Previous mass descriptor	Removed
Margin: circumscribed	Historically margin: smooth	Renamed to margin: circumscribed
Margin: not circumscribed: irregular and spiculated	Historically under mass: margin	Now under mass: margin: not circumscribed (A) Irregular (B) Spiculated
Internal enhancement characteristics	Historically under mass: mass enhancement (A) Homogeneous (B) Heterogeneous enhancement (C) Rim enhancement (D) Dark internal septations	Now under masses: internal enhancement characteristics (A) Homogeneous (B) Heterogeneous enhancement (C) Rim enhancement (D) Dark internal septations
Removal of enhancing internal septation and central enhancement	Historically under mass: mass enhancement (A) Enhancing internal septation (B) Central enhancement	Removed
Removal of non-mass-like enhancement terms	Historically under non-mass-like enhancement (A) Distribution modifiers: ductal (B) Internal enhancement: stippled, punctate (C) Internal enhancement: reticular, dendritic	Removed
Clustered ring enhancement pattern	N. S.	Non-mass enhancement: internal enhancement patterns: clustered ring
New finding categories	N. S.	New finding categories (A) Intramammary lymph node (B) Skin lesion
New terms under associated features	N. S.	Associated features (A) Skin invasion: direct invasion (B) Skin invasion: inflammatory cancer (C) Axillary adenopathy (D) Chest wall invasion (E) Architectural distortion

Table 3 (*Continued*)

	4th edition	5th edition
Renamed terms under associated features	Historically: nipple retraction or inversion	Renamed: nipple retraction
Removal of terms under associated features	N. A.	Removed from associated features (A) Pre-contrast high duct signal (B) Edema (C) Lymphadenopathy (D) Hematoma-blood (E) Abnormal signal void (F) Cyst
Addition of fat-containing lesions	N. S.	Fat-containing lesions (A) Lymph nodes: normal (B) Lymph nodes: abnormal (C) Fat necrosis (D) Hamartoma (E) Postoperative seroma, hematoma with fat
Kinetic curve assessment: initial phase	Historically (A) Slow (B) Medium (C) Rapid	Now (A) Slow (B) Medium (C) Fast
Implant material and lumen type	N. S.	Implants: implant material and lumen type (A) Saline (B) Silicone: intact (C) Silicone: ruptured (D) Other implant materials (E) Lumen type
Implant location	N. S.	Implants: implant location (A) Retroglandular (B) Retropectoral
Implant focal bulge	N. S.	Implants: abnormal implant contour: focal bulge
Intracapsular silicone findings	N. S.	Implants: intracapsular silicone findings (A) Radial folds (B) Subcapsular line (C) Keyhole sign (teardrop, noose) (D) Linguine sign
Extracapsular silicone	N. S.	Implants: extracapsular silicone (A) Breast (B) Lymph nodes
Implants: water droplets	N. S.	Implants: water droplets
Implants: peri-implant fluid	N. S.	Implants: peri-implant fluid

N. S.: information not previously specified; N. A.: not applicable.

Mass internal enhancement characteristics

The descriptors of ''homogeneous'', ''heterogeneous'', ''rim enhancements'', and ''dark internal septations'' have been relocated under the internal enhancement characteristics category which have previously been located under the historic category mass enhancement. The historic descriptors of ''enhancing internal septation'' and ''central enhancement'' have been removed due to underutilization.

Non-mass enhancement distribution

The 5th edition of BI-RADS® details multiple descriptors for the distribution of non-mass enhancement which should be applied to describe areas of enhancement without convex borders. The descriptors available to describe the distribution include ''focal'', ''linear'', ''segmental'', ''regional'', ''multiple regions'', and ''diffuse''. The historic descriptor ''ductal'' has been removed due to underutilization.

Non-mass enhancement internal enhancement patterns

To characterize the internal enhancement patterns of non-mass enhancement the lexicon provides the descriptors ''homogenous'', ''heterogeneous'', ''clumped'', and ''clustered ring''. The addition of ''clustered ring'' was added to describe suspicious enhancement of periductal stroma (Fig. 9). The historic term ''reticular, dendritic'' was removed due to underutilization as well as ''stippled, punctate'' as this pattern can be characterized by descriptors within background parenchymal enhancement.

Intramammary lymph nodes

The separate category of intramammary lymph node has been created with the 5th edition of the lexicon.

Skin lesions

The separate category of skin lesion has been created within the 5th edition. Benign enhancing pathology along the skin such as enhancing keloids or dermatitis are appropriate for this category.

New associated features descriptors

Many of the descriptors have carried over from the 4th edition including ''nipple retraction'', ''nipple invasion'', ''skin retraction'', and ''pectoralis muscle invasion''. New descriptors now found under associated features include ''axillary adenopathy'', ''architectural distortion'', and ''chest wall invasion'' (Fig. 10). ''Skin invasion'' has also been added with delineation between ''direct invasion'' and ''inflammatory cancer'' (Fig. 11).

Removed associated features descriptors

Several terms within the associated features category for MRI examinations were removed because of overlap or due to the creation of a new category. Examples of these changes include ''pre-contrast high duct signal'', ''edema'', ''lymphadenopathy'', ''hematoma-blood'', ''abnormal signal void'', and ''cyst''.

Fat-containing lesions

Several terms to denote fat-containing pathology were added into the lexicon. Descriptors for these lesions include ''fat necrosis'', ''postoperative seroma/hematoma with fat'', and ''hamartoma'' (Fig. 12). ''Lymph nodes'' may also be described as fat-containing if adipose tissue is demonstrated with further delineation as ''normal'' or ''abnormal''.

Kinetic curve assessment

The assessment of the kinetic curve is separated between the initial phase and the delayed phase. The initial

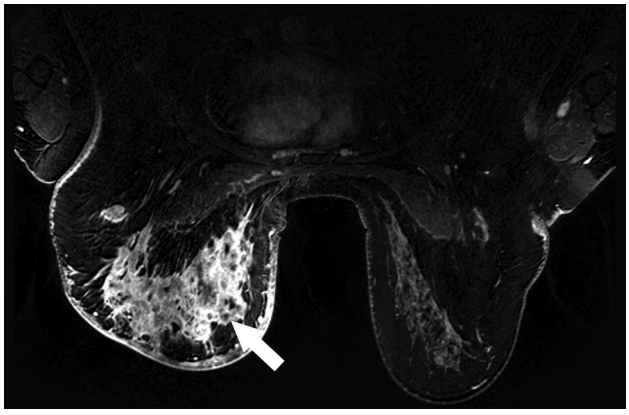

Figure 9. A 35-year-old woman with inflammatory breast cancer presenting for restaging after systemic therapy. T1-weighted fat-suppressed MRI obtained in the transverse plane following administration of a gadolinium chelate demonstrates marked left breast skin thickening and clustered ring enhancement (arrow). Subsequent MRI- guided biopsy revealed granulomatous mastitis.

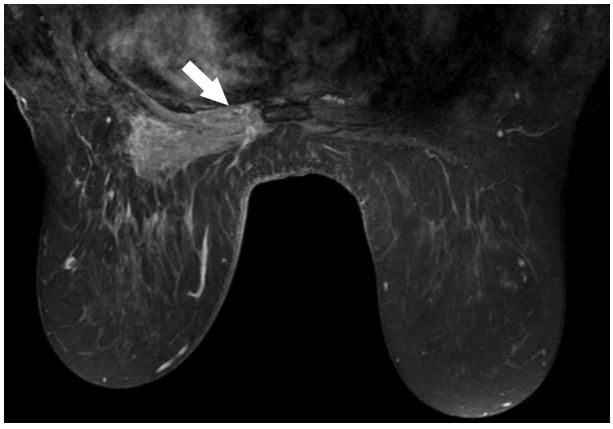

Figure 10. A 63-year-old woman with invasive lobular carcinoma of the left breast. T1-weighted fat-suppressed MR image in the transverse plane after administration of a gadolinium chelate demonstrates chest wall invasion as enhancement of the underlying chest wall and intercostal space (arrow).

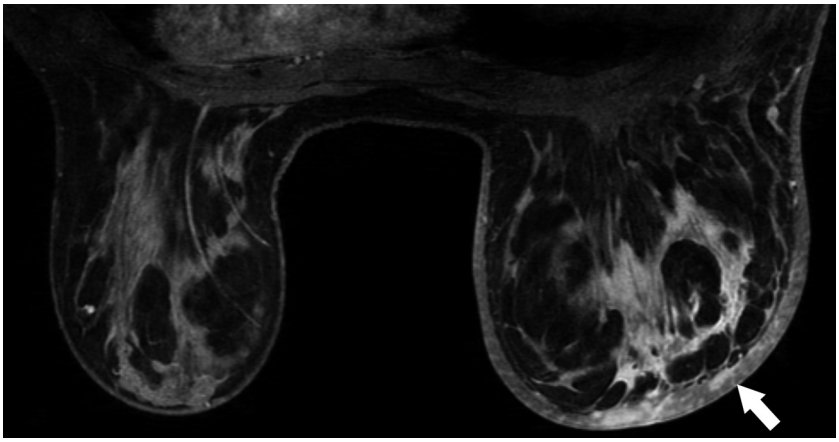

Figure 11. A 42-year-old woman with history of inflammatory right breast cancer, invasive ductal carcinoma, and ductal carcinoma *in situ*. T1-weighted fat-suppressed MR image in the transverse plane obtained after intravenous administration of a gadolinium chelate depicts marked global asymmetric skin thickening due to inflammatory breast cancer (arrow).

phase of the kinetic curve may be described as ''slow'', ''medium'', or ''fast'' which was historically titled ''rapid''. The descriptors available for the delayed phase remain ''persistent'', ''plateau'', and ''washout''.

Implant material and lumen type

Terms describing numerous facets of breast augmentation are available within the 5th edition of the lexicon. To describe breast material and lumen type the descriptors ''saline'', ''silicone: intact'', ''silicone: ruptured'', ''other implant material'' and ''lumen type'' are now available. The lumen type may also be characterized as ''single'', ''double'', or ''other''. Example alternative materials used in breast implants are soy oil, polypropylene, polyurethane, and sponges.

Miscellaneous

Implant locations. ''Retroglandular'' and ''retropectoral'' descriptors may be used to describe breast implant location.

Abnormal implant contour. The descriptor ''focal bulge'' has been created under abnormal implant contour to describe this form of implant irregularity.

Intracapsular silicone findings. Terms relating to radial folds and several common radiology signs associated with breast implants are provided in the new edition of the lexicon. The descriptors include ''radial folds'', ''subcapsular line'', ''keyhole sign'', and the ''linguine sign'' (Fig. 13).

Extracapsular silicone. ''Lymph nodes'' and ''breast'' are now available to describe the location of extracapsular silicone observed on a magnetic resonance examination.

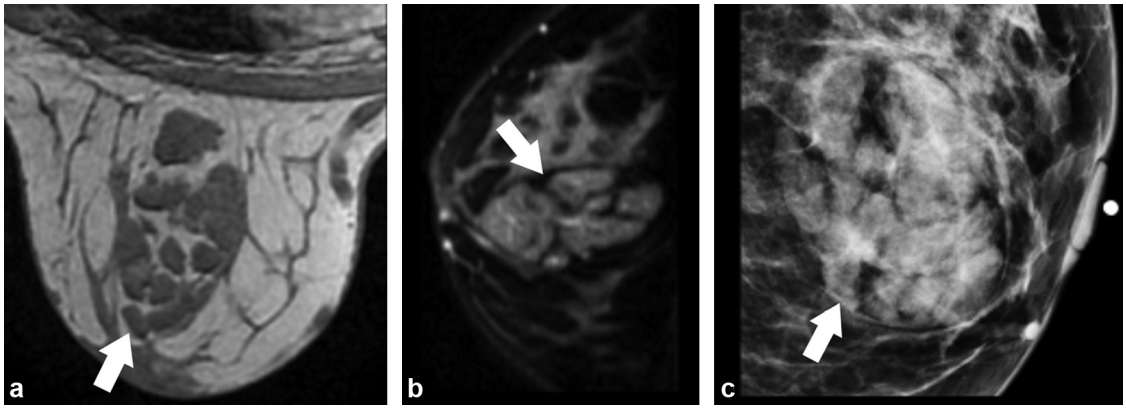

Figure 12. A 31-year-old woman undergoing MR examination for palpable abnormality without mammographic or sonographic correlate. (a) T1-weighted MR image obtained in the transverse plane demonstrates a fat-containing mass unrelated to the palpable abnormality compatible with known hamartoma (arrow); (b) T2-weighted fat-suppressed MR image obtained in the sagittal plane of the hamartoma demonstrates the interwoven fat within the mass (arrow); (c) cropped mediolateral oblique mammogram of the hamartoma (arrow).

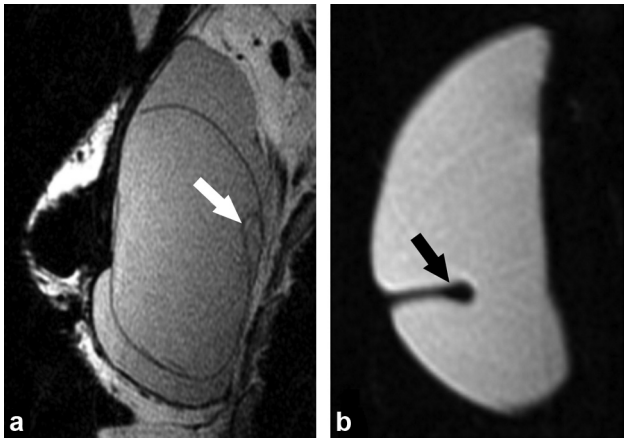

Figure 13. MR images obtained in two different women with breast implants. (a) A 65-year-old woman with history of right breast cancer following mastectomy and implant placement. T2-weighted MR image obtained in the sagittal plane demonstrates the linguine sign associated with intracapsular implant rupture (arrow); (b) a 74-year-old woman with a history of breast cancer following mastectomy and breast implant placement. Silicone specific MR image obtained in the sagittal plane demonstrates a radial fold (arrow) without implant rupture.

Water droplets. The ''water droplets'' descriptor has been created for water droplets associated with a breast implant.

Peri-implant fluid. ''Peri-implant fluid'' is a new descriptor available to describe fluid surrounding a breast implant.

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Disclosure of interest

The authors declare that they have no competing interest.

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