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MAMMOGRAPHY

Changes in BI-RADS 5th Edition

By Michael Rogan, MD

Radiologists are continually striving to improve the reports provided to ordering physicians. The goal is to provide clear, concise and accurate reports to ordering physicians. With this goal in mind, in 1993 the American Board of Radiology embarked on a landmark approach to communicate mammogram reports with the release of the first edition of Breast Imaging Reporting and Data Systems (BI-RADS). Since the first edition, the document has changed, grown and improved as imaging improved (Ultrasound, MRI, Digital Breast Tomosynthesis) and now there is a BI-RADS 5th edition. In this article, I will describe some of the changes that were made between the 4th and 5th edition, and give examples of what those imaging patterns look like.

Before the first release of BI-RADS lexicon in 1993, mammography reporting was a particularly frustrating endeavor, both for the radiologist and the ordering physician. The lexicon used in radiology reports prior to 1993 were often ambiguous or unintelligible descriptions without clear management advice or concise interpretation (1). With the release of the BI-RADS lexicon, the American College of Radiology had three goals:

1. Use lexicon descriptors designed to predict benign and malignant disease
2. Allow automatic data collection
3. Facilitate communication

Revisions to BI-RADS were made in 1995 (2nd version), 1998 (3rd revision), 2003 (4th revision), and 2014 (5th revision).

In each mammography report, there is always a phrase used to describe the density of the breast tissue. There was a change with this part from the 4th to the 5th edition. In the 4th edition, breast density was based on the % of grandular tissue (<25%, 25%-50%, 51%-75%, or > 75%). In the new edition, density is purely subjective, with the elimination of percentiles. (1) (Figure 1)

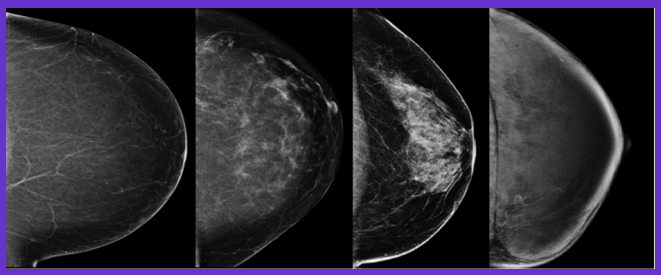

Figure 1: Subjective assessment of breast density. Cranio-caudal mammograms show findings characterized as almost entirely fatter (far left), scattered areas of fibroglandular density (second from left), heterogeneously dense (second from right), and extremely dense (far right).

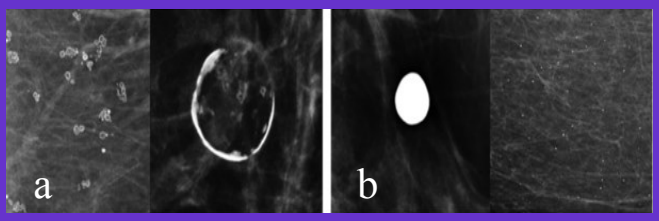

Figure 2: Calcifications. (a) Rim calcifications: Lucent-centered (left) and eggshell (right) calcifications have been combined into one category. (b) Round calcifications: Round (left) and punctate (right) calcifications have been combined into one category.

Calcification descriptions were changed in the new edition. In the 4th edition, calcifications were separated into 3 categories: typically benign, intermediate concern, and higher probability. In the 5th edition, the 3 categories were consolidated into 2 categories: typically benign and suspicious morphology. In the typically benign category, what were previously described as eggshell and lucent-centered calcifications have been combined into a new term, "rim". Typically benign also includes the term "round", which is a new combined descriptor for what was round and punctate in the 4th edition. (1) (Figure 2)

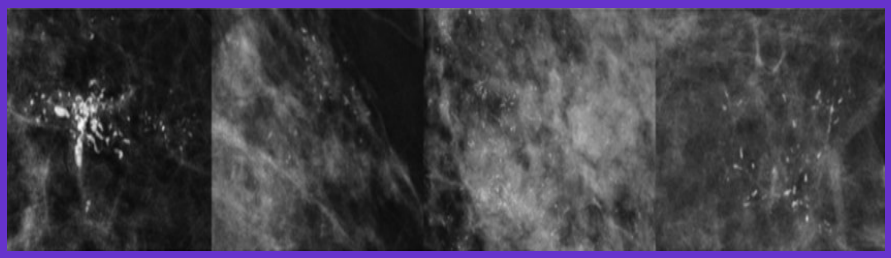

Figure 3: Calcifications with suspicious morphology. Images show calcifications with increasing risk of malignancy: coarse heterogeneous (far left) , amorphous (second from left), fine pleomorphic (second from right), and fine linear branching (far right).

In the calcification category of *suspicious morphology*, there are 4 descriptors used. The probability of malignancy is given for each descriptor in parenthesis: course heterogeneous (13%), amorphous (27%), fine pleomorphic (50%), and fine linear or fine branching (78%). Amorphous, coarse, and fine pleomorphic is considered a 4B report, and fine linear or fine branching is considered a 4C or 5 report. (1) (Figure 3)

Changes in BI-RADS 5th Edition Continued...

Whenever a mass is seen on a mammogram, the shape of the mass is needed to be described. In the 4th edition, 4 shape descriptors were available, but in the 5th edition those options were reduced to 3 choices: *oval, round* and *irregular* (in order of least likely malignant to most likely). The term *lobular* was removed. The margins of a mass is also an important descriptor that will help direct a radiologist recommendation. The margins can be described with the following terms: *circumscribed, obscured,, microlobulated, indistinct,* and *speculated.* (Figure 4) These are in order of least concerning to most concerning.

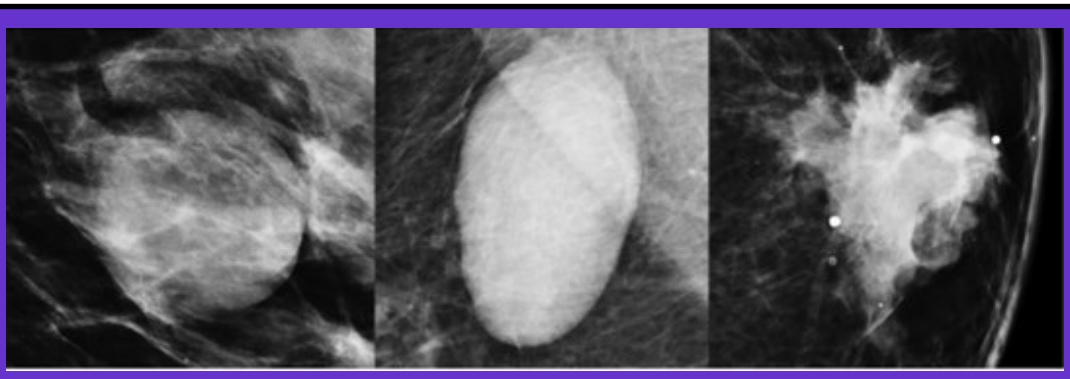

Figure 4: Mass shape. From left to right, round, oval, and irregular masses. An irregular mass has a higher probability of malignancy.

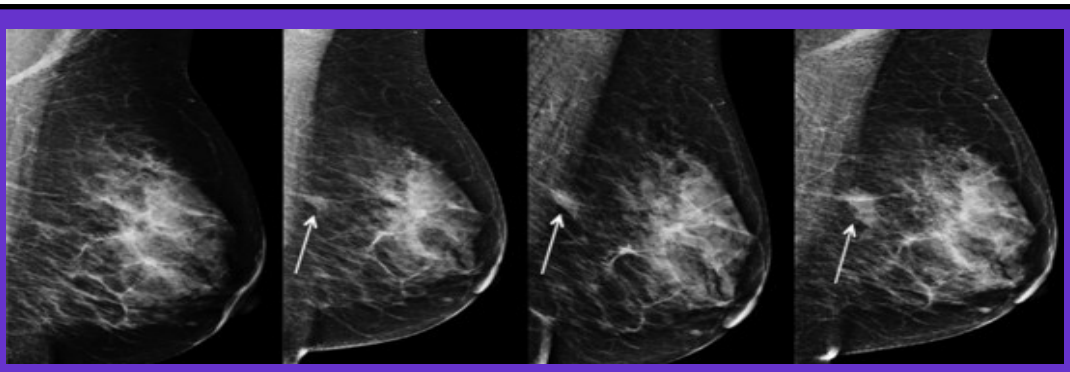

Figure 5: *Developing asymmetry*. Mediolateral oblique mammograms obtained at annual screenings in the same patient are displayed from oldest (far left) to most recent (far right). An asymmetry in the posterior central breast (arrows) becomes more conspicuous and increases in size over time. The finding is consistent with a *developing asymmetry*, a new term added to the mammography lexicon.

In the 4th edition, there were three terms to describe asymmetry. There is a new term in the 5th edition, *developing asymmetry.* An asymmetry is a term used to describe asymmetric tissue in a breast that is not a mass. There are now 4 types of asymmetric tissue that can be described in the 5th edition. There is *asymmetry*, which is an area of asymmetric fibroglandular tissue seen on only 1 view (usually a summation artifact). *Global asymmetry* is at least one quadrant asymmetric tissue, usually a normal variant. *Focal asymmetry* is seen on 2 views, less than one quadrant (0.5%-1% risk of malignancy persists without explanation after work up). *Developing asymmetry* is a focal asymmetry that is new or larger. (Figure 5) This new term has shown a 15% risk at malignancy, and would place it in a BI-RADS 4 category. (1).

Describing the location of a lesion in the breast was also changed from the 4th to 5th editions. In the 4th edition, location and depth of the lesion was all that was needed. In the 5th edition, the location descriptors were expanded to include laterality, quadrant and clock face, depth, and distance from the nipple.

As you can see, radiologists and the American Board of Radiology work hard to improve communication between ordering physicians and the radiologist. When radiologists use appropriate BI-RADS lexicon, clinicians will have a better understanding of what the descriptors clinically mean for the patient

Michael Rogan, MD

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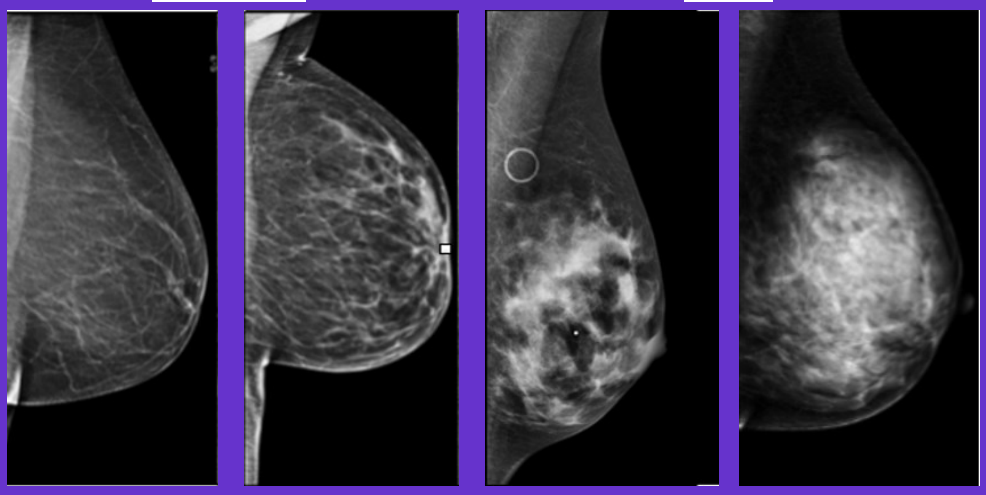
Breast Density and Supplemental Screening

By Amanda Lenderink-Carpenter, MD

In April of 2017, Colorado became one of 30 states to enact some type of legislation on breast density notification (Nebraska is also among those 30 states). The legislation takes effect October 1, 2017. The legislation requires that anyone performing mammography in the state of Colorado provide patients with a letter if they are found to have dense fibroglandular tissue.

Figure 1



What is dense breast tissue?

The breast tissue is made up of two components: fibroglandular tissue and fat. The fibroglandular tissue blocks x-ray and appears black on mammography. Every woman has a unique combination of fibroglandular tissue and fat. A woman with dense breasts has more of the fibroglandular tissue and less fat. A woman who does not have dense breasts has more fat and less fibroglandular tissue. Breast density has nothing to do with how the breast feels or how it looks from the outside. "Lumpy bumpy" breasts are neither indicative of dense breast tissue, nor are they indicative of fibrocystic change. Fatty breasts can also feel very "lumpy". Only mammography can determine if the breast is dense. Breast density can also change throughout a woman's lifetime. Premenopausal woman often have higher density and the breasts become more fatty after menopause. Taking exogenous hormones, weight gain or loss, pregnancy and lactation are among some of the factors that can significantly change a woman's breast density from year to year (Figure 1).

Why does it matter?

Breast density can obscure cancers on mammography. This increases the likelihood that a cancer will not be seen on a mammogram, particularly small cancers in women with extremely dense breasts. Breast density is also associated with increased risk of breast cancer. There are theories on why this association exists, but there is no current evidence that there is a direct causal relationship between breast density and breast cancer. It is important to remember that there are many other factors that increase the risk of breast cancer, and breast density is only part of the big picture. It is also important to remember that the vast majority of newly diagnosed breast cancers occur in women with no risk factors at all, so women who do not have dense breast tissue should also keep current with their mammography screening.

What is going to change under the new Colorado legislature?

Beginning October 1, 2017, patients who fall into the category of heterogeneously dense or extremely dense will now receive a letter with the following standard language:

"Your mammogram shows that your breast tissue is dense. Dense breast tissue is common and is not abnormal. However, dense breast tissue can make it harder to evaluate the results of your mammogram and may also be associated with an increased risk of breast cancer. This information about the results of your mammogram is given to you to raise your awareness and inform your conversations with your doctor. Together, you can decide which screening options are right for you. A report of your results was sent to your physician."

What are the current recommendation for supplemental screening?

There is no single best choice for optimal supplemental screening that is right for every patient. Breast density is only one of many risk factors that need to be considered when evaluating screening regimens. All of the supplemental screening options have benefits and potential harms. Women need to take into account all their risk factors as well as their personal preferences when discussing supplemental screening with their doctor. Currently the three primary supplemental screening examinations are: Tomosynthesis, MRI and Ultrasound.

MRI — Contrast enhanced breast MRI is the preferred supplemental screening test for women with greater than 20% lifetime risk of developing breast cancer. This is an expensive, highly sensitive test that should only be used in high risk patients. It has a very high false positive rate, particularly when used in patients who are not high risk. This test is not recommended in women with dense breast alone who have no additional risk factors such as a genetic mutation, strong family history, or a personal history of a high risk finding such as ADH. Most insurers will not cover this exam unless the patient meets the 20% lifetime risk criteria.

Breast Density and Supplemental Screening Continued...

Screening breast ultrasound — Although studies have shown that screening ultrasound does find additional breast cancers, there is no evidence that there is a reduction in patient mortality. In fact, the only breast examination which has ever been shown to reduce mortality is mammography. The primary limitation of screening ultrasound is its exceptionally high false positive rate. Screening breast ultrasound has been shown to increase the number of unnecessary breast biopsies by 5-fold. The other limitation of screening ultrasound is the significant amount of time that it takes to both perform and interpret the examination. Currently, there is no CPT code for a screening breast ultrasound, and there is no mandate for insurance to cover this exam in the state of Colorado. For all of these reasons, we do not currently endorse screening breast ultrasound.

Tomosynthesis —Tomosynthesis is the current diagnostic test of choice in women with dense breast tissue. It can allow the radiologist to see through areas of dense tissue which can both show additional cancers masked by overlying breast tissue as well as avoid a false positives by demonstrating superimposition of normal breast tissue without the need for spot compression images. It is the ONLY supplemental screening examination that results in a DECREASE in false positive exams. It has also been shown to have up to 40% increase in cancer detection. The risks of tomosynthesis include an increased radiation dose, although the dose is still well below the FDA allowable limits for standard 2D mammography. The dose also continues to decrease as the "synthetic" 2D imaging technology continues to improve. As with all supplemental screening options, there is additional cost. Although Medicare is paying additional tomosynthesis fees, there remain several private insurers who do not. It is also important to note that tomosynthesis has been shown to increase cancer detection and reduce false positives in both women with dense breasts as well as women who do not have dense breasts, which is why we recommend tomosynthesis for all of our screening patients (Figures 2 & 3).

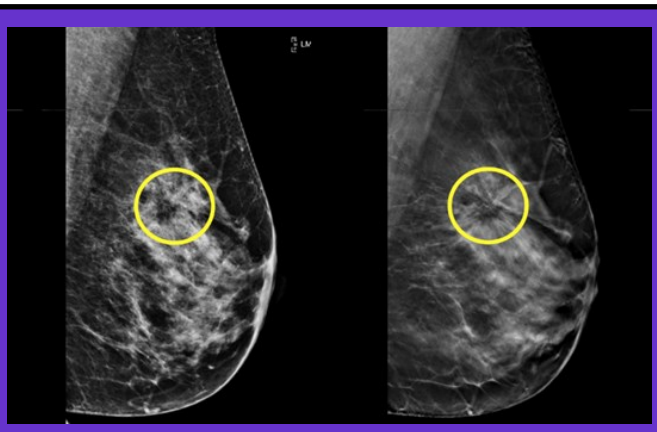


Figure 2: Tomosynthesis image (right) clearly shows architectural distortion which is difficult to see on the 2D image (left). This turned out to be invasive cancer. (Image courtesy of Habib Rahbar MD).

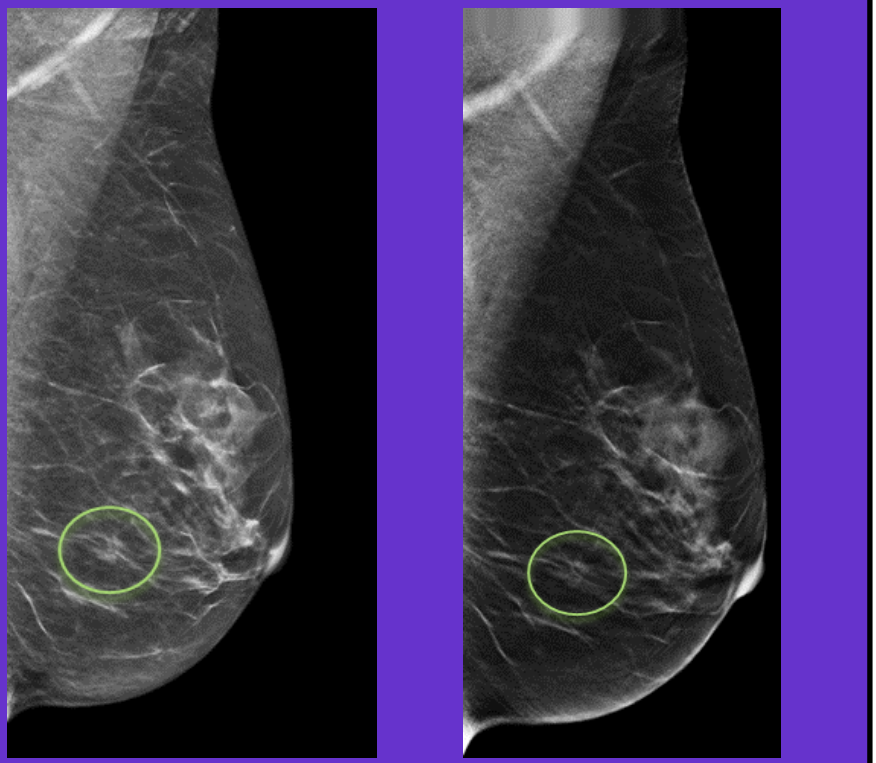


Figure 3: In this case the 2D image (right) shows a focal asymmetry. The tomosynthesis image (left) reveals that this is just overlapping breast tissue, a normal finding. An example of tomosynthesis preventing a false positive examination.

What to do now?

Women are encouraged to talk to their physician about their risk factors and personal preferences and engage in shared decision making for a screening regimen that is right for her. Women should also do their own research and come prepared to have this conversation with their doctors. I recommend that women obtain their research from reliable sources. A great place to start is www.densebreast-info.org.

Amanda Lenderink-Carpenter, MD

Invasive Lobular Carcinoma of the Breast

By Nicholas Statkus, MD

The most common form of breast cancer is invasive ductal carcinoma. Invasive lobular carcinoma is the second most common type of breast cancer occurring much less frequently at 10-15 % of breast cancer cases.

The pathologic scaffolding/ growth pattern of these two forms of breast cancer differ in two main ways with resultant differing clinical presentations. The cells in lobular breast cancers have a linear pattern of growth within the breast parenchyma compared to ductal carcinoma where the cancer cells are more clumped/grouped (figure 1). This leads to lobular cancers being more infiltrative with a less distinct tumor mass compared to ductal breast cancers which typically have a more defined mass. Additionally, there is a relative lack of desmoplastic reaction surrounding lobular breast cancers as compared to invasive ductal carcinomas which often have associated desmoplastic reaction. The desmoplastic reaction seen with the ductal carcinoma cell-type results in firm tissue surrounding the mass that makes the cancer easier to detect on physical exam and aids in mammographic/ ultrasound detection (figure 2).

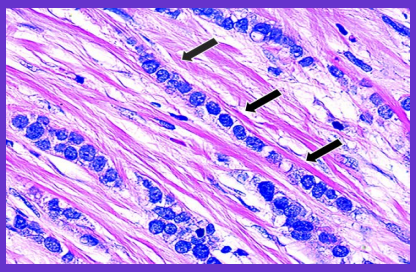


Figure 1: Pathologic slide of lobular breast carcinoma shows the linear/single file growth pattern characteristic for lobular breast cancer (black arrows).

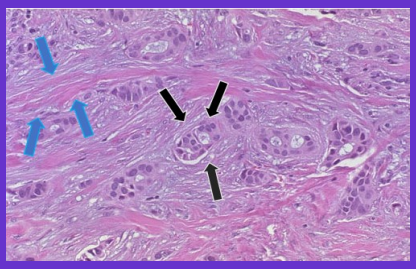


Figure 2: Pathologic slide of invasive ductal carcinoma shows the cancer cells in clusters/groups (black arrows) which differs from the linear pattern seen with lobular carcinoma. Additionally the pink bands of tissue (blue arrows) represent the collagenous desmoplastic reaction surrounding the cancerous cells which increases the firmness of the mass and thus increases the conspicuity of the mass both on physical exam and on imaging studies.

The linear/infiltrative growth pattern and lack of desmoplastic reaction with lobular cancer leads to the mass being less palpable on physical exam and additionally makes the mass more difficult to visualize on mammography and ultrasound (figure 3). The mammographic false negative rate for invasive lobular carcinoma is 19% in some series. The degree of breast density affects the ability to detect both the ductal and lobular types of breast cancer however lobular breast cancer is particularly more difficult to diagnose in a breast with greater than 50% fibroglandular tissue.

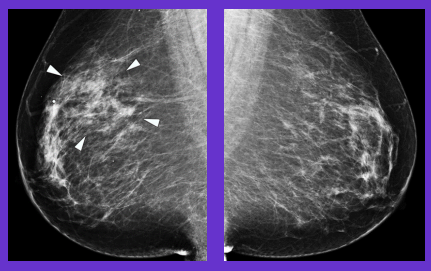


Figure 3: The right breast (image on the left) shows asymmetric tissue in the upper breast (white arrowheads) in keeping with a lobular breast cancer. Notice how this breast cancer is very difficult to visualize on the mammogram. The malignant lobular cancer has a similar appearance to normal breast fibroglandular tissue without a discrete mass thus making it difficult to detect. The lobular cancer in this case causes a definite asymmetry when compared to the opposite breast however asymmetric fibroglandular tissue is a relatively common finding on mammograms and is often a benign/ variant finding. Lobular cancers such as this lead to the increased false negative rate seen with mammography.

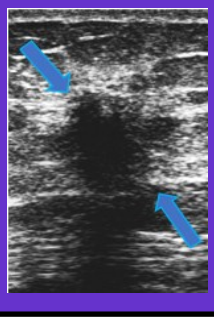


Figure 4: Ultrasound image of the same patient from Figure 3 visualizes the lobular cancer (blue arrows) much better than mammogram which is often the case with lobular cancers. Notably lobular cancer can be difficult to visualize with ultrasound and is not always this conspicuous which adds to the difficulty of diagnosing this particular form of breast cancer.

The most common mammographic finding seen with lobular carcinoma is a spiculated or ill-defined mass. Architectural distortion is the second most common imaging finding. Microcalcifications can be seen with invasive lobular carcinoma but much less frequently when compared to ductal carcinoma. Ultrasound is useful in the detection of lobular breast cancer often showing an ill-defined, hypoechoic mass however, as with mammograms the mass can be difficult to visualize as well (figure 4). Breast MR can be a useful trouble shooting imaging study to help diagnose lobular breast cancer however is not 100 % sensitive or specific.

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