Positioning in Breast MR Imaging to Optimize Image Quality

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After completing this journal-based SA-CME activity, participants will be able to:

■ Recognize common artifacts resulting from improper positioning for breast MR imaging.
■ Discuss techniques to improve positioning to optimize image quality in breast MR imaging.
■ Describe techniques to improve positioning for MR imaging–guided breast procedures.

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Improper positioning of the breasts in a dedicated breast coil causes inhomogeneous fat saturation as well as other artifacts that decrease the sensitivity of breast magnetic resonance imaging. Improper positioning can create artifacts that can obscure a malignancy or cause it to be missed. Goals of proper positioning include imaging the maximum area of breast tissue, minimizing skin folds, and achieving homogeneous fat suppression and nondeformed breast parenchyma. Review of prior images gives the technologist an impression of what the positioning and imaging challenges may be in each patient before the patient enters the imaging unit. Checking the triplane localizer images and repositioning as necessary before any diagnostic or interventional imaging is key. Using a fat saturation pad, changing the arm position, or “rolling” the patient may be considered in difficult cases. Padding to support the patient in an oblique position, using angled sponges to increase breast compression thickness, and raising the grid to access posterior lesions may be helpful in targeting difficult-to-access lesions for biopsy. Using the presented positioning techniques and suggestions, in addition to strict attention to detail before imaging, will improve image quality, decrease imaging time and suboptimal images, and limit the need for repeat imaging studies.
Introduction
Since the inception of mammography in the early 1970s, breast positioning has been known to be an important aspect of quality control for detection of malignancies. Mammographic positioning is technologist (operator) dependent, and a great deal of time and effort have been spent teaching techniques for achieving adequate breast tissue visualization and minimizing skin folds and other artifacts to optimize image quality. Positioning is not easy; poor positioning can cause a breast cancer to be missed. The most common reason for American College of Radiology mammography accreditation failure is inadequate positioning (1).

Contrast-enhanced breast magnetic resonance (MR) imaging is highly sensitive in detection of invasive malignancies compared with mammography and breast ultrasonography (US). Its success is dependent on many factors, including injection of gadolinium contrast material, use of a high-field-strength magnet that undergoes routine quality control, use of a dedicated breast coil, high-spatial-resolution imaging, appropriate timing of the dynamic sequences, lack of artifacts, and adequate breast positioning. In an article on breast MR imaging artifacts, Harvey et al (2) state that “excellent positioning is key in breast MR imaging, just as it is in mammography.” In their textbook on breast MR imaging, Morris and Liberman (3) report that “distortions of the breast...can result in signal hotspots, poor image quality in the regions of the chest wall and axilla, and anatomical distortions that make image interpretation difficult.” To our knowledge, there is little information in the current literature on the specifics of breast positioning and its effects on the quality of MR images.

In breast MR imaging, positioning is technically more difficult than positioning for MR imaging of other areas of the body due to prone positioning of the breasts, an external nonfixed organ. Imaging is technically challenging due to the high percentage of fat in the breast tissues, the fat-air interface at the skin surface, and variability in breast sizes and shapes. There continues to be lack of uniformity in breast MR imaging worldwide, with different philosophies on the significance of morphology and of dynamics, use of fat saturation techniques versus subtraction, and balancing the advantages and disadvantages of these differences.

Regardless of differences in imaging units, philosophies, and techniques, attention to positioning within the dedicated breast imaging coil is as important as attention to positioning in mammography. Improper positioning creates artifacts that can (a) obscure a malignancy or (b) cause a malignancy to be missed due to nonimaging of an area.

Goals of proper positioning include imaging the maximum area of breast tissue, minimizing skin folds, preventing undue breast deformation, and achieving homogeneous fat suppression across the entire breast volume. If the breast tissue is free-hanging, the inflow of contrast material will be more consistent throughout the breast tissues, in comparison with improperly positioned breast tissue compressed against the coil; such tissue may have decreased blood flow, potentially causing nonenhancement or delayed enhancement of a malignancy (4).

The objectives of this article are to provide (a) a guide to recognizing common artifacts that result from improper positioning for breast MR imaging and (b) suggestions to avoid such artifacts. Specific topics include positioning in breast MR imaging, artifacts due to improper positioning and their causes, missed cancer due to poor positioning, pseudo cancer due to improper positioning, effect of arm position, positioning for MR imaging–guided procedures, and examples of difficult access during MR imaging–guided intervention. Pearls and pitfalls in patient positioning will be shared so that imaging can be optimized for both diagnostic and interventional breast MR imaging procedures.

It is critical for radiologists and technologists to recognize artifacts due to suboptimal positioning, to identify the causes of these artifacts, and to address the need to direct resources toward improving the training of MR imaging technologists in optimal breast positioning. Elimination of artifacts due to improper positioning will improve cancer detection and imaging efficiency and accuracy.

Positioning in Breast MR Imaging

Use of Dedicated Breast MR Imaging Technologists

Dedicated breast MR imaging technologists, either with prior mammography technologist experience or a strong interest in breast imaging, are more likely to be successful in obtaining consistent and optimal breast MR images. Trained motivated technologists are more likely to pay attention to details, ask pertinent questions, and understand the patient issues that can affect positioning. Dedicated breast MR imaging technologists will benefit from the high volume of breast-specific experience. Owing to the similarities in positioning for mammography and breast MR imaging, observing mammographic positioning may be helpful in positioning for breast MR imaging as well as MR imaging–guided interventional breast procedures (4).
in laundering and can also cause skin folds due to cloth lines placing pressure on the skin.

Figure 1a is an example of an open coil system, in which the patient lies prone with the breasts draped through the right and left apertures. There is room on the side of each breast for the technologist to position the breast and smooth out skin folds. This is in contrast to Figure 1b, which is an example of a closed coil. Note that in the closed coil, it is difficult to access the breast to allow optimal positioning.

Technique of Positioning the Patient in the Coil
Technologists have found the following steps helpful in positioning patients: 

(a) Guide the patient into the coil and center the breasts over the center bar. 
(b) Check breast position from the lateral, medial, and top-down positions. 
(c) Repeat the positioning check with the other breast.

Review of Prior Images
If the patient has undergone previous breast MR imaging, review of the prior images is instrumental in guiding good patient positioning. Year-to-year comparison may show good, bad, and better positioning. Features that are helpful to survey on the prior MR images are breast size, anatomy, prior surgery, presence of implants, fat suppression, and field of view. Reviewing the prior images gives the technologist an impression of what the positioning and imaging challenges may be in each patient before the patient enters the imaging unit.

Coil Setup
Proper breast coil setup is an important first step in reducing artifacts. Disposable linen to protect the coil and on which the patient lies is preferable to cloth linen (Fig 1a). Cloth linen including towels and sheets can cause artifacts from starch

Figure 1. Coil setup. (a) Example of an open coil system. Disposable paper linen protects the coil and is preferable to cloth linen. (b) Example of a closed coil system.

Figure 2. Guiding the patient into the coil. As the patient positions herself in the coil, the technologist's hand over the patient's back guides the patient into the coil while the other hand smooths out inferior breast skin folds by pulling downward toward the patient's feet (arrow), maintaining tension as the breast drops into the coil.

Guide the Patient into the Coil and Center the Breasts over the Center Bar.—As the patient lowers herself into the dedicated breast coil, the technologist's hand over the patient's back guides the patient into the coil. The other hand smooths out any inferior breast skin folds by pulling downward toward the patient's feet, maintaining tension as the breast drops into the coil (Fig 2).

A visual check is performed to see that the breast is centered from top to bottom and from left to right (Fig 3). For proper positioning, the patient should be centered over the bilateral breast coil symmetrically with the sternum overlying the center bar. The steps to check each breast's position include smoothing out the inframammary folds from the lateral view, checking the breast position from the top down, smoothing out the medial folds, then the same steps to check the other breast.
When unilateral breast MR imaging is performed, such as in patients who have undergone mastectomy, the sternum should also be centered over the center bar.

**Check Breast Position from the Lateral, Medial, and Top-Down Positions.**—Movie 1 shows the steps in positioning a balloon model from the lateral view. The patient’s right breast is shown from the lateral view, with the patient’s head toward the right side of the screen and the patient’s feet toward the left side of the screen. The technologist’s right hand smooths out the folds at the superior aspect of the breast as the left hand smooths out the inframammary folds.

After ensuring proper position from the lateral view, move to the top of the coil and check breast position from the top down. The breast can appear well positioned from the lateral view but may actually be pointing medially when viewed from the top down (Fig 4). Remember that the breast is a three-dimensional organ and that positioning requires viewing from both the side and top to ensure adequate three-dimensional positioning.

Movie 2 demonstrates smoothing of the medial tissue from the top down. To achieve this, the right hand smooths out the medial tissue by pulling the breast tissue down and out from the sternum while the left hand stabilizes the breast and ensures that the lateral breast remains fold-free. Figure 5 shows the properly positioned breast from the top-down view.

**Repeat the Positioning Check with the Other Breast.**—It is critical to position and check both the right and left breasts. Repeat the positioning check with the other breast to make sure the other breast is optimally positioned, meaning check from lateral, medial, superior, and inferior. To properly perform this step, the technologist must walk from one side of the table to the other side. Before imaging, perform one final visual check from the top down to ensure that the patient has not moved.

**Position the Nipple in Profile**
It is desirable to place the nipples in profile for breast MR imaging. In mammography, when the nipple is not in profile, it can mimic or obscure a retroareolar mass. Similarly, when the nipple is not in profile in breast MR imaging, it can mimic a mass by compressing the breast in an unexpected location or cause decreased inflow of contrast material in the adjacent tissues due to compression against the coil, thereby decreasing the visibility of a mass. Positioning the nipple in profile from the lateral view can be achieved by pulling out laterally from the sternum to smooth the tissue, then double-checking to ensure that
the inferior, superior, and sternal breast tissue has no skin folds (Movie 3).

Check the Triplane Localizer Images

Check the triplane localizer images for proper position before any further imaging and reposition as necessary. Although it may seem time-consuming and bothersome to reposition the patient, it will reduce recall rates for poor image quality and save time, aggravation, and cost in the long run.

Features to check on the triplane localizer images are centering of the breast tissue within the coil, positioning of the nipple in profile, and absence of skin folds or artifacts in the superior, inferior, medial, and lateral tissues.

Artifacts Due to Improper Positioning and Their Causes

Poor Superior Positioning

If the breast is positioned too far superiorly in the coil, decoupling can occur superiorly. Coil decoupling mechanisms are circuits activated by diodes (within the coil) to prevent radiofrequency currents from flowing in the receive-only direction during transmission from the body coil. Decoupling results in local distortion of the transmit field and signal intensity variations within the image (5). This local distortion of the transmit field and signal intensity can occur if too much pressure or weight is put on the coil in one specific area, causing the diodes within the coil to operate less optimally. Sometimes this can be prevented by thin padding between the body part and the coil.

Figure 6a shows breast positioning too far superiorly in the coil, resulting in the MR image in Figure 6b, which shows artifact from poor fat saturation due to decoupling superiorly. In contrast, Figure 6c shows homogeneous fat suppression due to optimal breast positioning within the coil.

Poor Fat Suppression

Figure 7a is an example of poor breast positioning and resultant uneven fat suppression medially.
and laterally. The patient was positioned too far superiorly in the coil, such that there was decoupling of the coil elements and subsequent inconsistent fat suppression laterally and medially at the sternum. Figure 7b was obtained with the same patient properly positioned in the center of the coil and demonstrates much better image quality. If the technologist had recognized the problems on the triplane localizer images and repositioned the patient before any further imaging, the imaging study would have been of much better quality and the patient would not have had to be recalled for the repeat study.

**Poor Medial Positioning**
The breasts should ideally be hanging freely in the coil, with the nipples straight down, as this causes the breast parenchyma to be evenly spread out and allows contrast material to flow uniformly into the tissues. When the nipples are pointing medially, the medial tissue will be compressed and the fat saturation will be inhomogeneous. When the technologist is in the imaging unit viewing the patient from the top down, from head to feet, if the breast tissue is pointing medially, the medial tissue should be pulled...
out from the sternum laterally, or down and out. Proper positioning of the nipple and breast will also be evident on the triplane localizer images. If the breast and nipple are noted to be pointing medially on the triplane localizer images, reposi-

Skin Folds

Figure 8a is an example of skin folds noted later-

Large Breasts

Large breasts are challenging to image due to the fixed size of the breast coils and magnet bores. Figure 10 shows inhomogeneous fat suppression medially (Fig 10a) as well as superiorly and inferiorly (Fig 10b). In addition, there is anterior puddling: compression of the anterior breast tissue and flattening of the nipples against the coil (Fig 10c). This causes contrast agent flow to be nonuniform into the retroareolar tissue, and cancers in this location may not have the same enhancement kinetics as expected. Positioning may be improved by placing a pad on the coil underneath the patient’s sternum and lifting the patient up so that the breasts hang freely. Better positioning will result in subsequent improved imaging (Fig 10d).
Figure 11a shows a breast that is too large for the coil and uneven appearance of the skin with many folds as it overfills the coil. As a result, the breast parenchyma is crowded together and contrast material will not flow evenly into the tissue. (b) Corresponding image after repositioning in a larger coil shows smooth skin, absence of skin folds (arrows), and more evenly spread out breast parenchyma.

Figure 12 shows smooth skin, no folds, and more evenly spread out breast parenchyma after repositioning. In this case, a coil was initially used that had a fixed cup for the breast; a larger coil was used to obtain the improved image.

Figure 12 is another example of MR imaging of a patient with large breasts, with inhomogeneous fat suppression medially at the sternum due to breast tissue pressing directly against the coil due to large patient size. A solution is to use padding to elevate the patient off the coil or to use a fat saturation pad.

There are patient limitations such as body habitus and physical condition, as well as equipment limitations such as the bore of the magnet or coil size, which make achievement of perfect images in all patients unrealistic.

Inferior Bulge
Figure 13a shows an inferior bulge on a sagittal triplane localizer image, with resultant inhomogeneous fat suppression. If such a bulge is seen, the solution is to lift and roll the patient, pulling the breast tissue up and the abdominal tissue down. The goal is to have the breast tissue inside the coil and abdominal tissue outside the coil. Figure 13b shows resolution of the inferior bulge after repositioning. Figure 13c shows inhomogeneous fat suppression inferiorly as a result of an inferior bulge, and Figure 13d shows the effect of removing the bulge.

Fat Saturation Pad
A fat saturation pad is an image enhancement device that can be used to make fat suppression more homogeneous. A fat saturation pad or “fat sat pad” is a pad or envelope containing perfluorocarbon liquid that is placed between the patient and the coil (6,7). Use of fat saturation pads was originally described in the neuroradiology literature due to the soft tissue–air interface of the
neck anatomy. The fat saturation pad eliminates the air-tissue interface of the neck, thus improving the uniformity of the main magnetic field and attenuating magnetic field distortions.

We have applied the technique of fat saturation pad use to the breast due to the similarities of a soft tissue–air interface and signal intensity variations in the neck and breast. When applied to the breast, the fat saturation pad eliminates the air-tissue interface caused by sharp-angled anatomic structures such as the junction of the breast and chest wall or at a surgical scar by making the imaged region more spherical or cylindrical. The perfluorocarbon liquid has no hydrogen atoms, is nontoxic, and is chemically stable. Because the fat saturation pad has magnetic susceptibility similar to that of human tissue, it will not contribute any signal to the MR images when placed between the patient and the coil.

Figure 14 shows examples of fat saturation pads. Figure 14a shows a brachial plexus fat saturation pad that we have found useful for the breast. Figure 14b shows a fat saturation pad designed for the breasts. We use a fat saturation pad in approximately 25% of patients. The frequency of use and extent of image improvement will vary depending on the imaging unit, sequences, patient population, and patient body habitus.

Figure 15a shows poor positioning of a fat saturation pad inferiorly adjacent to a balloon model of the breast, with the model positioned too far superiorly in the coil, not free hanging, and not straight. The nipple is pointing toward the patient’s head. Figure 15b shows proper positioning of a fat saturation pad, with the balloon model of the breast hanging freely within the coil, closer to the inferior aspect of the coil.

Other examples of use of a fat saturation pad include correcting poor fat suppression superiority, inferiorly, and posteriorly (Fig 16). The fat saturation pad can be wrapped around the
breast superiorly and inferiorly, which will help even out the posterior signal. Figure 16c shows an example of homogeneous fat suppression achieved by using a fat saturation pad.

**Prior Surgery**

Figure 17 shows a patient who underwent lumpectomy and radiation therapy. The scar caused an uneven skin surface and therefore an uneven fat-air interface, resulting in inhomogeneous fat suppression (Fig 17a). Figure 17b shows homogeneous fat suppression after placement of a fat saturation pad. The pad was placed inferiorly (Fig 17c), which helped make the scar more level, flatter, and less concave, resulting in a better, more homogeneous image.

**Implants**

Imaging the breast parenchyma of a patient with implants can be challenging. Figure 18a shows a patient whose silicone implants bulged out to the sides. The patient was imaged with her arms down by her sides, with special attention given to smoothing out the folds, and by using a fat saturation pad, resulting in a more normal appearance of the breast parenchyma around and in front of the implants (Fig 18b).

**Missed Cancer Due to Poor Positioning**

Figure 19 shows a patient with inhomogeneous fat suppression on the left side initially; this was recognized by the technologist and imaging was repeated, which resulted in inhomogeneous fat suppression on the right side (Fig 19a). Owing to the bilateral inhomogeneous fat saturation, the patient returned for a repeat study. Images from the repeat study showed a 1-cm enhancing mass in the right inferior medial breast with adjacent non-masslike enhancement (Fig 19b), findings
that were not initially visible. Biopsy demonstrated invasive ductal carcinoma. A cancer could be missed due to suboptimal positioning.

The patient in Figure 19 had asymmetry in breast size, with the left breast larger than the right. For the repeat study, a fat saturation pad was placed underneath the right breast. The fat saturation pad gave additional signal to the smaller breast to make up for the loss of breast tissue volume within the coil, so the imaging unit was “fooled” into thinking the coil was filled with a uniform amount of fat. The uniform amount of fat within the coil made the fat suppression more homogeneous on the resultant images.

**Pseudo Cancer Due to Improper Positioning**

Figure 20a shows a pseudo mass or pseudo cancer due to improper positioning, with the nipple directed laterally and pressed against the coil, mimicking a mass lesion or cancer. The patient returned for repeat study with proper positioning, which demonstrated normal breast parenchyma (Fig 20b).

**Effect of Arm Position**

In general, at our institution, we perform diagnostic breast MR imaging with the patient’s arms over her head for improved patient comfort; this positioning typically leads to decreased motion (Invivo breast MRI coil, Gainesville, Fla). In addition, when a patient’s arms are at her sides, there may be shoulder wrap or wrap from the tissues of the arm, which may cause artifact, limiting image quality.

However, there may be select cases in which it is advantageous to have the patient’s arms by her sides. For example, in patients who have a body habitus with more mobile or fatty tissue, who tend to have concave bell-shaped breasts, bringing the arms down by the sides smooths out the bell shape so that there is less concavity, allowing the breast tissue to be more evenly distributed over the image volume and improving fat saturation homogeneity.
In a smaller patient, bringing the arms up over the head brings the pectoralis muscle up, so that less breast tissue is in the coil. When the arms are down by her sides, the nipple is more likely to be in profile and there will be more breast tissue within the coil to be imaged.

Optimal arm position—up or down—may also vary depending on different coil manufacturers and models. There are coils for which it is recommended that the patient’s arms be by her sides. Specifically, there is a coil with shoulder bridges that externally rotate the patient’s arms, so that the shoulders are out of the way and the pectoralis muscles are relaxed (Sentinelle breast MRI coil; Hologic, Bedord, Mass). These shoulder bridges decrease wrap into the breast tissues by bringing the arms more posteriorly so that if there is any wrap, it is posterior to the breast tissue.

Whether the arm position is up or down, the key is to look at breast tissue or areas of concern (eg, axilla, inferior portion of breast tissue) for uniform contouring of the breast, without concavity.

Positioning for MR Imaging–guided Procedures
Optimizing patient positioning for MR imaging–guided breast procedures can (a) facilitate procedures by increasing efficiency and confidence in targeting the correct lesion and (b) allow access to lesions that would otherwise be difficult or impossible to access.

Review of Prior Diagnostic Images
Review of the patient’s diagnostic MR images on which the biopsy recommendation was based is essential to help guide good patient positioning. Features to look for include the location of the lesion in relation to the breast anatomy, the shape of the breast (eg, bell-shaped, effects of surgery, presence of implants), breast size (large or small), and predominant tissue type (fatty or dense). By reviewing the prior diagnostic MR images in both the axial and sagittal planes, one can estimate how and where the lesion will be visualized when positioned in mild compression and where the lesion may be located on the biopsy grid.
When possible, it is ideal to reproduce the positioning from the diagnostic images; however, altering the breast position is sometimes necessary for placement of the targeted lesion in the biopsy window. For example, it is optimal to have the nipple in profile for diagnostic MR imaging, but this can be compromised if necessary for biopsy positioning to achieve placement of the target in the biopsy window.

Using Padding to Roll the Patient
Padding can help access posterior lesions for biopsy. A rolled blanket or towel supports the patient in a prone oblique position, bringing the posterior tissue further down and into the coil so that it can be accessible for the biopsy (Fig 21). If the lesion is lateral and posterior, rolling the patient away from you may bring the lesion into the biopsy window. If the lesion is medial...
and posterior, rolling the patient toward you may bring the lesion into the biopsy window. The goal is to move the target lesion into an accessible position in the biopsy grid. If the lesion is posterior, placing the arms down by the patient’s sides may bring the tissue more anterior and therefore within the biopsy grid.

Rolling the breast tissue can also be helpful when biopsying a superficial lesion or a lesion close to the nipple. This can bring the lesion away from the skin or away from the nipple, thus allowing the biopsy to be performed safely.

Using Sponges to Bolster Breast Tissue
If breast compression thickness is inadequate for biopsy, particularly as may be seen in elderly patients, bolstering the breast tissue with padding may allow the biopsy to be performed safely. Angled or rectangular sponges (Fig 22a) may also be used in thinner areas of the breast such as anterior tissue adjacent to the nipple and inferior tissue. Figure 22b shows how sponges may increase anterior compression for biopsy.

There are some circumstances, however, in which the breast compression thickness may be inadequate—despite bolstering attempts—to safely allow percutaneous biopsy to be performed. In this case, MR imaging–guided wire localization with surgical biopsy may be necessary for diagnosis.

Raising the Grid to Access Posterior Lesions
If using a grid to biopsy a posterior lesion, raising the grid may provide additional access to posterior lesions. In Figure 23a, the grid is raised so
that a posterior lesion is more accessible. Figure 23b is an example of a different grid, showing that the coil element can be moved down to access posterior lesions.

Awareness of Altered Landmarks
Remember that altering the breast position can alter the adjacent landmarks from the diagnostic imaging examination to the biopsy. This may add additional challenges when performing the biopsy.

Examples of Difficult Access during MR Imaging–guided Intervention
This section provides examples of lesions that are difficult to access.

Core Biopsy of a Far Posterior Mass
Figure 24 is an example of an enhancing mass in the far posterior right breast at MR imaging and subsequent MR imaging–guided core biopsy. Biopsy was achieved by rolling the patient such that the right lateral breast tissue fell further into the coil and raising the grid for more posterior access.

Wire Localization of an Axillary Mass
Figure 25 shows a patient who underwent left mastectomy with transverse rectus abdominus myocutaneous (TRAM) flap reconstruction 17 years earlier in whom a new 4.7-cm left axillary mass was detected at chest MR imaging. US with subsequent US-guided core biopsy was performed and demonstrated poorly differentiated invasive ductal carcinoma, consistent with a left chest wall recurrence. The patient underwent neoadjuvant chemotherapy, which resulted in the mass shrinking to $1.6 \times 0.7$ cm, deep to the left pectoralis muscle.

The surgeon requested imaging–guided wire localization for surgical removal, as the mass was no longer palpable due to the location. It was not definitively identified with US after neoadjuvant chemotherapy, so preoperative MR imaging–guided wire localization was chosen. With the patient in the prone position, with her arm over her head, and rolled away, we were able to access this far posterior axillary lesion for wire localization.

Biopsy of Patients with Implants
Figure 26 shows a high-risk screening patient with silicone implants and linear non-masslike
Figure 25. Wire localization of an axillary mass in a 66-year-old woman who underwent left mastectomy with transverse rectus abdominus myocutaneous (TRAM) flap reconstruction 17 years earlier in whom a left chest wall recurrence was detected. (a) Axial postcontrast T1-weighted MR image shows a new 4.7-cm enhancing left axillary mass. US and US-guided core biopsy were performed with a pathologic finding of invasive ductal carcinoma, consistent with a left chest wall recurrence. (b) Axial postcontrast T1-weighted MR image after neoadjuvant chemotherapy shows decrease in size of the mass (circle) to 1.6 × 0.7 cm. Preoperative MR imaging–guided wire localization was requested by the surgeon. (c) Axial postcontrast T1-weighted MR image of the left breast shows an MR imaging–compatible localization wire (arrow) placed through the mass to guide surgical excision. Access was achieved by placing the patient in the prone oblique position supported by padding and with her arm over her head.

Figure 26. Biopsy of a high-risk screening patient with silicone implants. (a) Axial postcontrast T1-weighted MR image shows the biopsy target of linear non-masslike enhancement (NMLE) (yellow arrow) in the right breast. The breast is compressed in the MR imaging biopsy grid anteriorly, and the silicone implant (white arrow) is displaced posteriorly. (b) Sagittal postcontrast T1-weighted MR image shows the MR imaging biopsy grid (arrows) placed anterior to the implant, with the implant (arrowheads) posterior to the grid and out of the way of the biopsy. The pathologic result was benign columnar alteration with prominent apical snouts and secretions (CAPPS) with microcysts and focal epithelial hyperplasia.
enhancement (NMLE) laterally and posteriorly in the right breast, for which biopsy was recommended. The patient was positioned with the biopsy grid anterior to the implant. The slight compression resulted in the implant moving posteriorly and out of the way so that MR imaging–guided core biopsy could be performed safely.

The pathologic result was benign columnar alteration with prominent apical snouts and secretions (CAPPS) with microcysts and focal epithelial hyperplasia. The pathologic findings were thought to be concordant and 6-month follow-up MR imaging was recommended. At follow-up, there was decreased enhancement consistent with postbiopsy changes, and the patient returned to routine screening MR imaging and mammography.

Biopsy of Medial Lesions

To perform core biopsy of a medial lesion, the contralateral breast must be moved up and out of the breast coil. This can be achieved by placing a tray or firm plastic covering over the breast coil opening (Fig 27). Ensure the contralateral breast is as flat as possible so that the breast for which biopsy is being performed is as low into the coil as possible. Occasionally, posterior medial masses may be too far posterior for positioning using a medial approach, so a lateral approach may need to be used for biopsy.

Conclusion

Using the positioning techniques and suggestions in this article, in addition to strict attention to detail before imaging, will improve cancer detection and imaging efficiency and accuracy. Checking the triplane localizer images and repositioning as necessary before any diagnostic or interventional imaging is key. Using a fat saturation pad, changing the arm position, or rolling the patient may be considered for difficult cases, both diagnostic and procedural.

Despite all heroic attempts at positioning, there are limitations in the form of patients’ body habitus and physical condition, as well as equipment limitations such as magnet bore size and coil size or shape, that prevent acquisition of perfect images from being a reality in all patients.

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References

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Technologists have found the following steps helpful in positioning patients: (a) Guide the patient into the coil and center the breasts over the center bar. (b) Check breast position from the lateral, medial, and top-down positions. (c) Repeat the positioning check with the other breast.

Check the triplane localizer images for proper position before any further imaging and reposition as necessary.

Optimizing patient positioning for MR imaging–guided breast procedures can (a) facilitate procedures by increasing efficiency and confidence in targeting the correct lesion and (b) allow access to lesions that would otherwise be difficult or impossible to access.