Skin Marking in Digital Breast Tomosynthesis: Unique Markers Establish Consistency and Efficiency

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Introduction

The use of skin markers during mammography is a simple and effective way to identify palpable masses, moles, prior surgical scars, nipples, and other areas of concern or pain.

Their consistent use improves communication across the care team and can help make interpreting mammograms more efficient and accurate.

Implementing a marking system that consists of unique and distinctive shapes provides certainty when interpreting images.

The Beekley Skin Marking System® has five different shapes that uniquely identify the area of interest on the breast: a circle for a raised area on the skin such as a mole, a line for a previous surgery, a triangle for a palpable mass, a solid pellet for the nipple, and a square for non-palpable areas of concern or pain.

As a Breast Imaging Radiologist at Mercy Health, I can attest to the benefits of the consistent use of these skin markers.

In my experience, I have seen them improve efficiency, increase confidence in the location of known pre-existing areas, reduce recalls, minimize additional imaging, and improve patient satisfaction.

In this paper I will discuss and give examples of my use of each of the five markers in the Beekley Skin Marking System for mammography. I will also touch upon how I successfully encouraged the use of the markers across all facilities in my health system.

Clinical and Operational Benefits of Using Skin Markers		
Reduce Patient Recalls and Additional Imaging	Improve Efficiency and Workflow	Minimize Additional Radiation Exposure
Heighten Accuracy	Enrich Permanent Documentation	Reduce Unnecessary Tests and Procedures
Improve Clarity	Reinforce Concordance	Save Time
Guide Interventions	Enhance Patient Satisfaction	Reduce Uncertainties

Nipple Marking

Case Summary

79-year-old patient presented for routine screening Digital Breast Tomosynthesis (DBT). With normal mammographic positioning, the patient's nipples are out of profile. In these CC views (see Figure NM1) the nipple is identified by a nipple marker (TomoSPOT® REF 781, Beekley Medical®) and can be seen several centimeters posterior to the anterior skin line centrally. The left nipple is also out of profile medially resulting in a loss of medial tissue in the image.

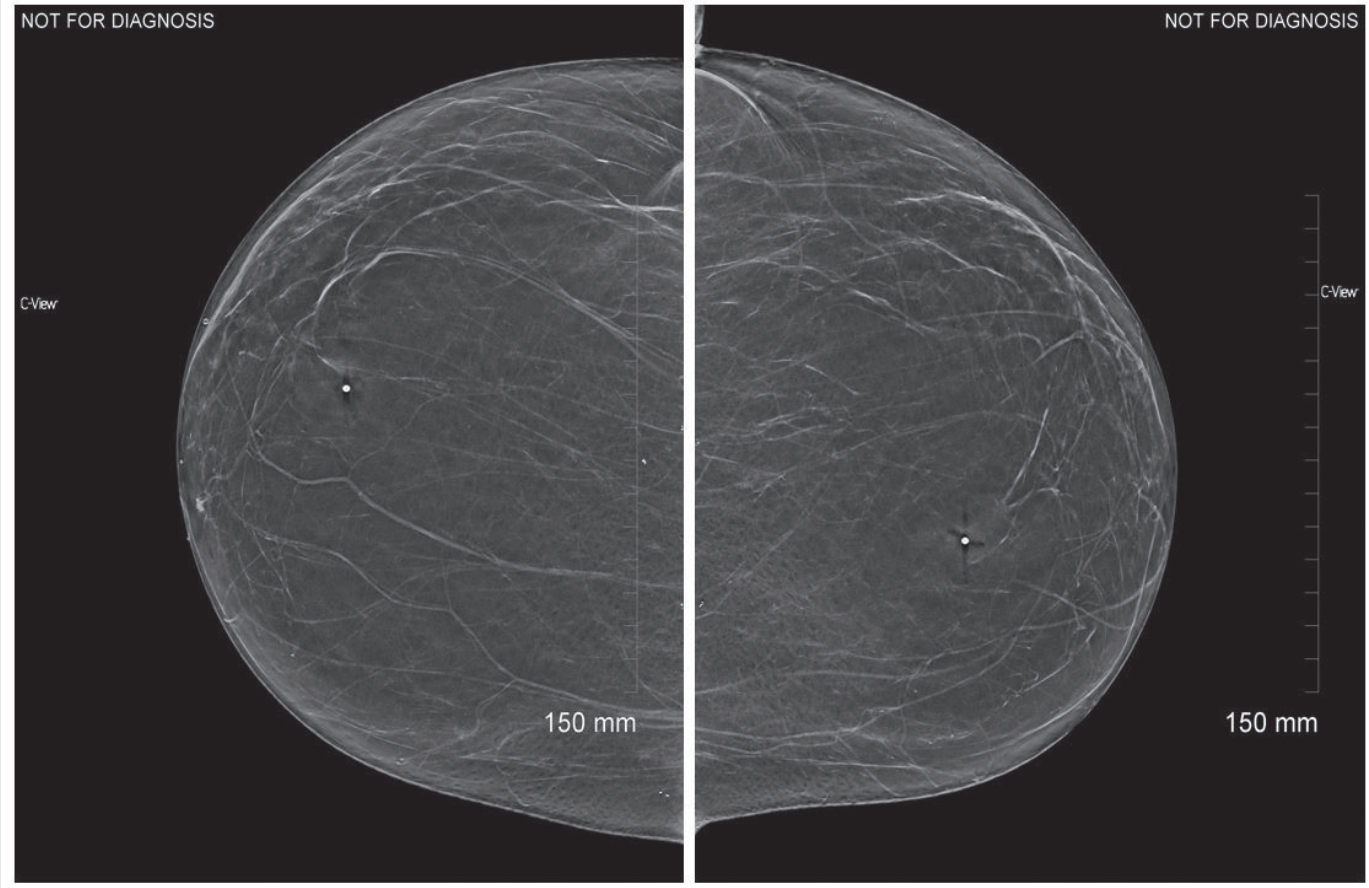

Figure NM1. R CC and L CC views showing nipples out of profile.

Nipple Marking

Figure NM2 shows the MLO projection. Nipple is noted by the nipple marker and is seen posterior and inferior to the normal nipple location. In the R MLO view there is a mole, as noted by the circular mole marker, in the area where you would normally expect the nipple to be. If neither the mole nor the nipple were marked there could be confusion.

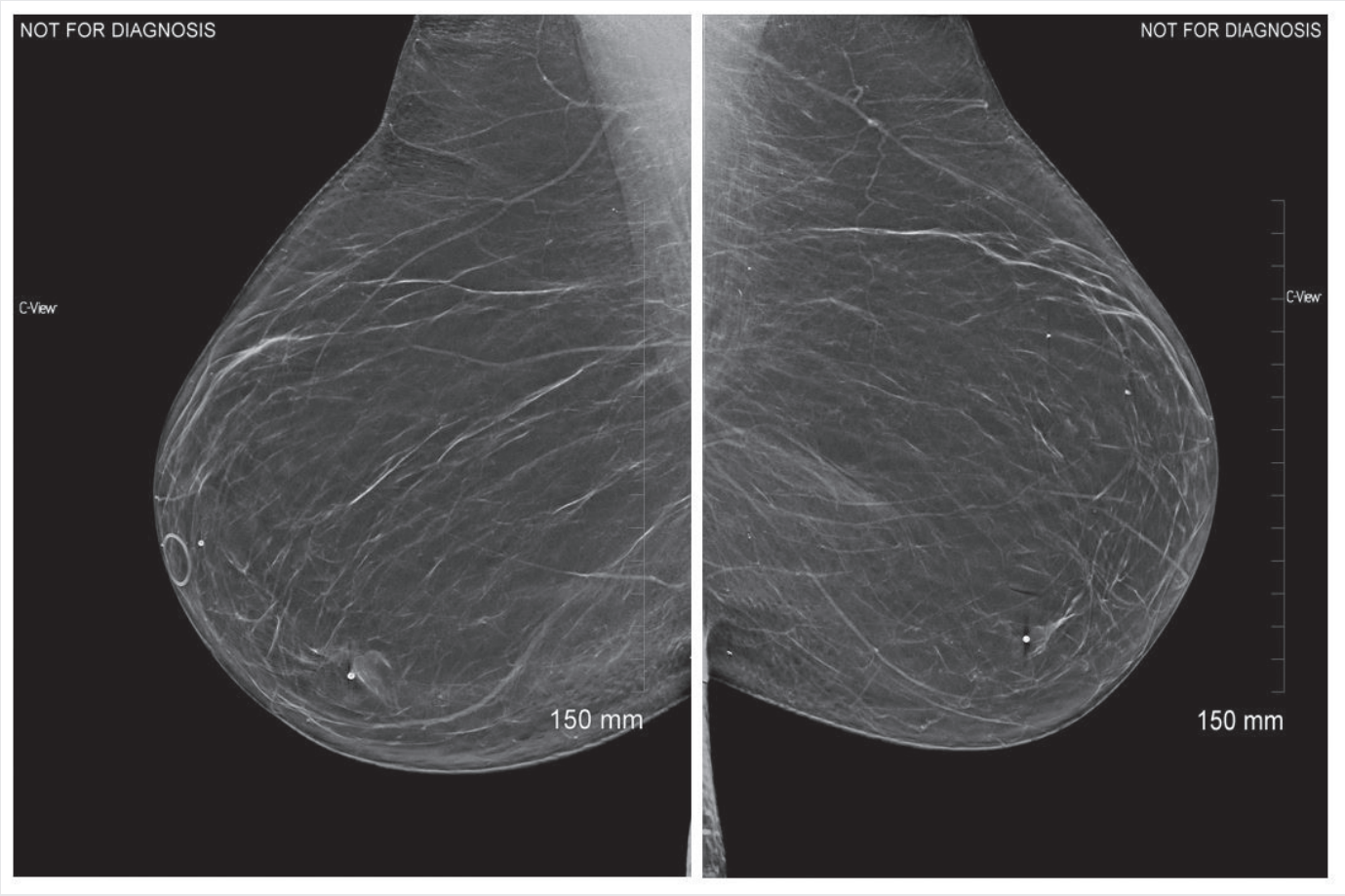

Figure NM2. R MLO and L MLO views with nipple marker and circular mole marker.

Nipple Marking

Since the nipples are significantly out of profile this could be considered a mass or abnormality if not marked. To confirm that these were in fact nipples out of profile a “nipple in profile” CC view was obtained (see Figure NM3). Without this information the initial interpretation time would have been longer and the patient might have been called back for diagnostic mammography.

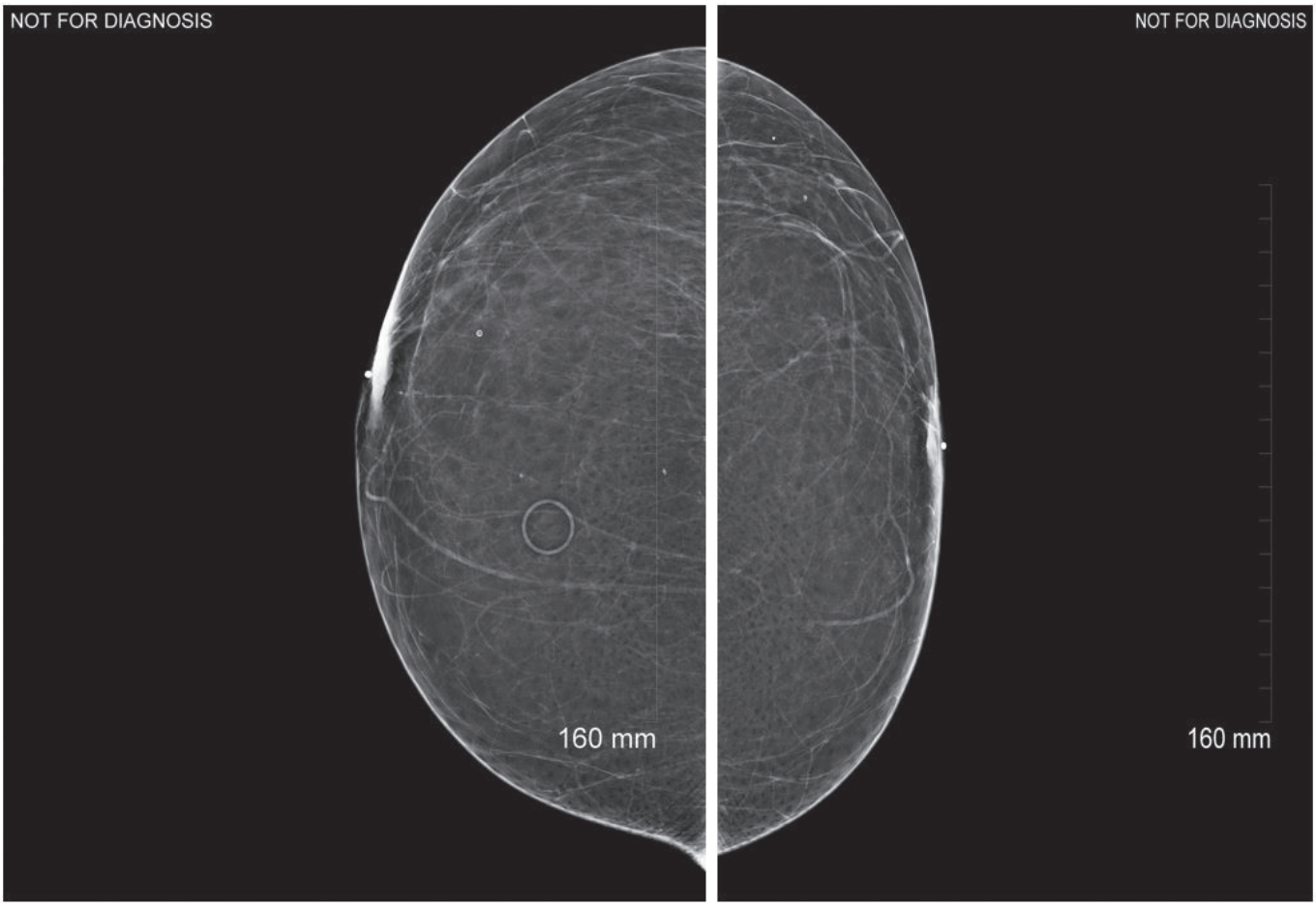

Figure NM3. R CC and L CC views with nipple in profile.

Why were nipple markers important?

- **PREVENTED RECALL:** Marking with a nipple marker prevented a callback and reduced interpretation time.
- **ACCURACY:** Use of both nipple markers and a mole marker clarified what was seen in the images.
- **CLARITY:** Demonstrated that the nipple was in profile and confirmed that medial and lateral tissue was captured.

Mole Marking

Case Summary

77-year-old patient presented for DBT. Single dermal mole was present and marked with a lucent circular mole marker (TomoSPOT® REF 782, Beekley Medical®) (see Figure MM1).

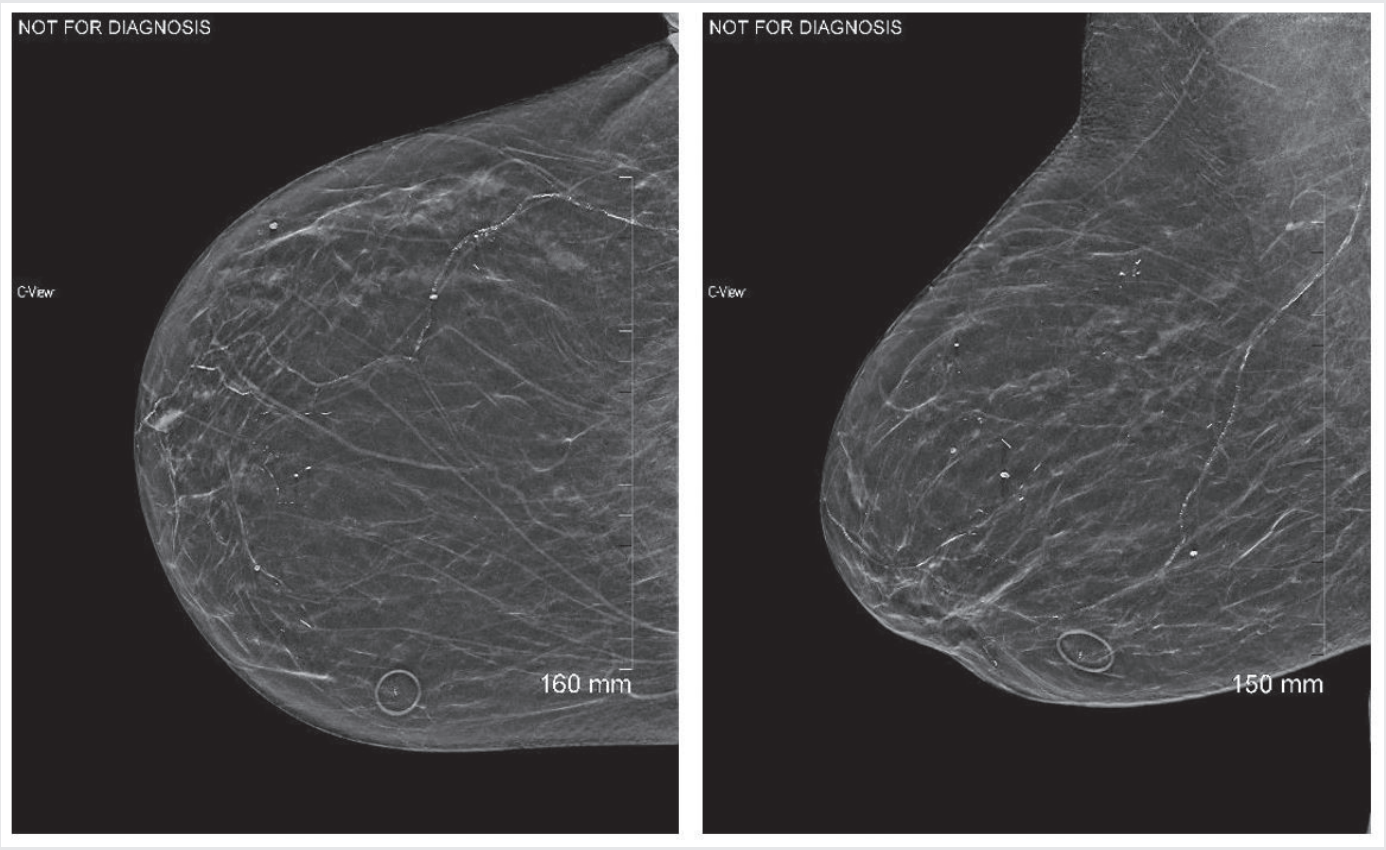

Figure MM1. R CC and R MLO DBT views showing circular mole marker.

Mole Marking

The enlarged images in Figure MM2 reveal the presence of several calcifications. It is important for the radiologist to determine if these calcifications represent a finding that requires further investigation, so it's imperative to know if the calcifications are within the skin or within the breast.

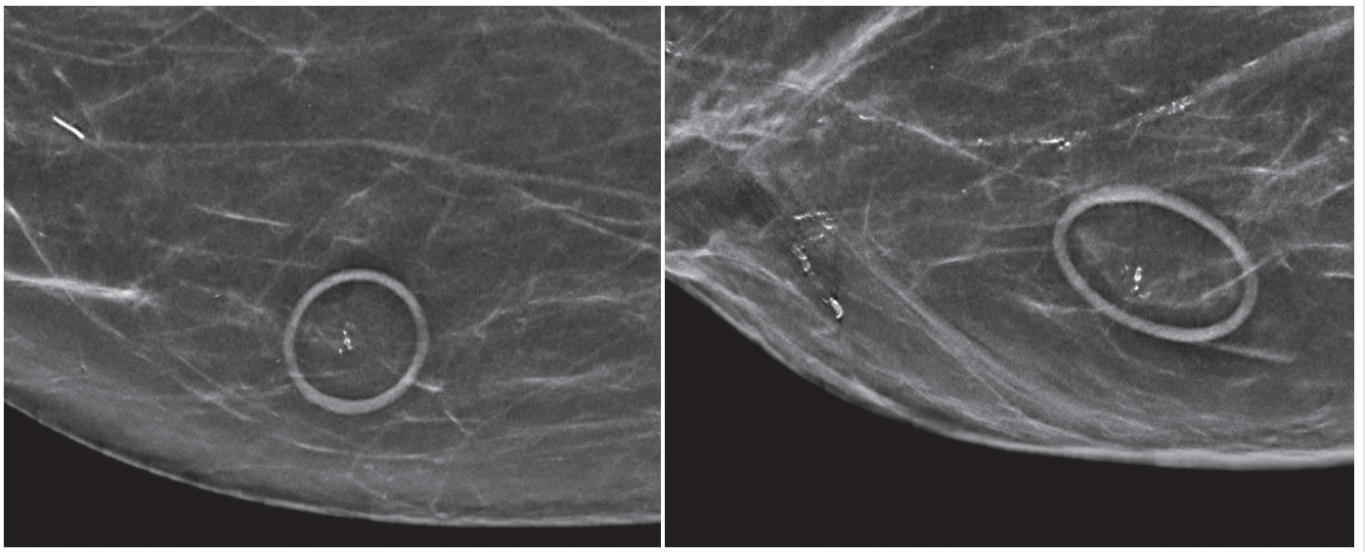

Figure MM2. Enlarged R CC and R MLO views.

Mole Marking

Figure MM3 shows the DBT images of the area of concern. The soft tissue image of a raised mole and nearby calcifications are captured within the center of the circular mole marker. Calcifications were localized to the first slice. Final diagnosis was that the calcification is within a skin mole and determination was made that no additional imaging was necessary.

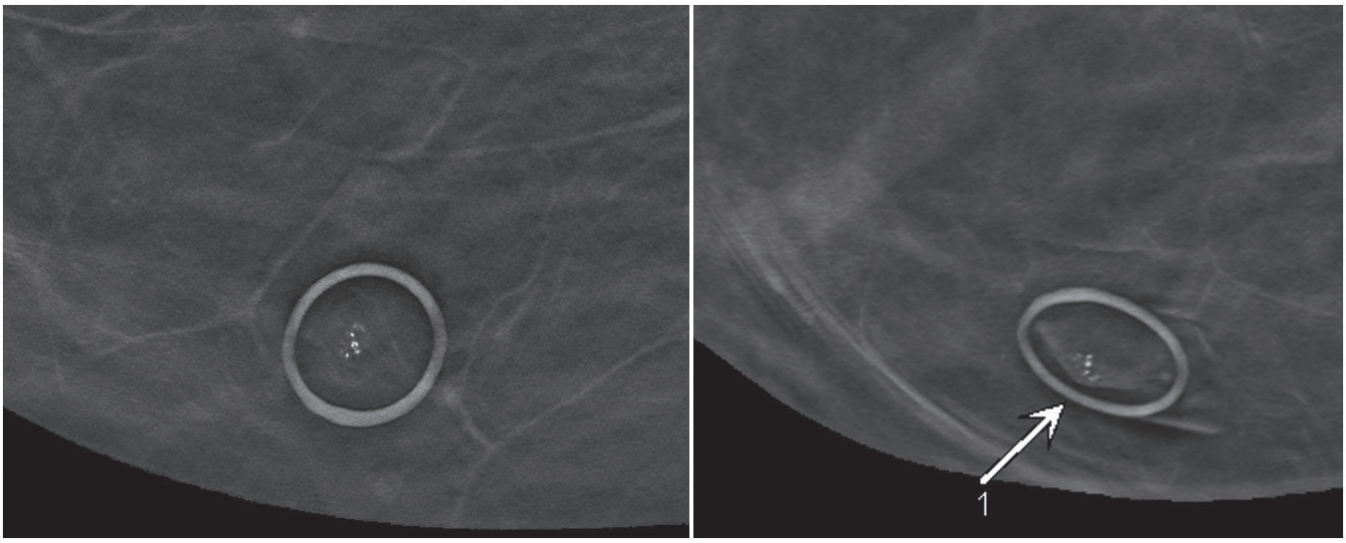

Figure MM3. First slice R CC and R MLO views with circular mole marker. Marker helps confirm calcification is within the skin mole.

Why were mole markers important?

- **IMPROVED WORKFLOW:** The use of a mole marker reduced interpretation time and eliminated the need for additional imaging.
- **PREVENTED RECALL:** Because the calcifications were within the mole marker and localized to the first slice we could be confident the calcifications were in fact dermal and within the mole.
- **PERMANENT DOCUMENTATION:** The findings from the mammogram become a clear and permanent part of the patient's record, which is particularly important if images are transferred to another location.

Scar Marking

Case Summary

61-year-old female patient seen for screening mammography. The patient did not report any history of breast surgery. Architectural distortion was identified in both views of the left breast (see Figure SM1).

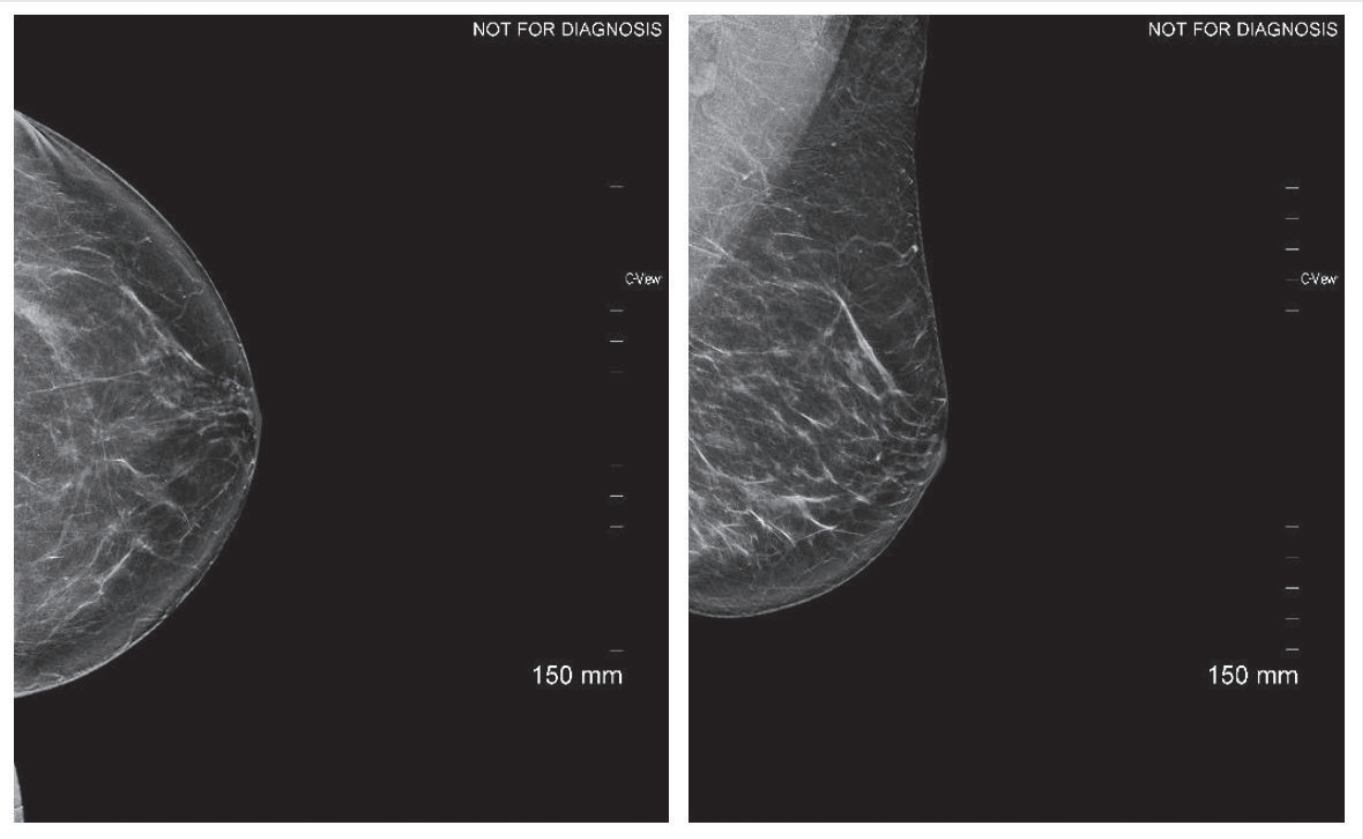

Figure SM1. Architectural distortion seen in L CC and L MLO views during DBT.

Scar Marking

Figure SM2 clearly shows the architectural distortion. Patient is recalled for additional imaging. If the technologist had discovered the post-surgical scar during the screening mammogram and used a scar marker, the additional imaging exam could have been avoided.

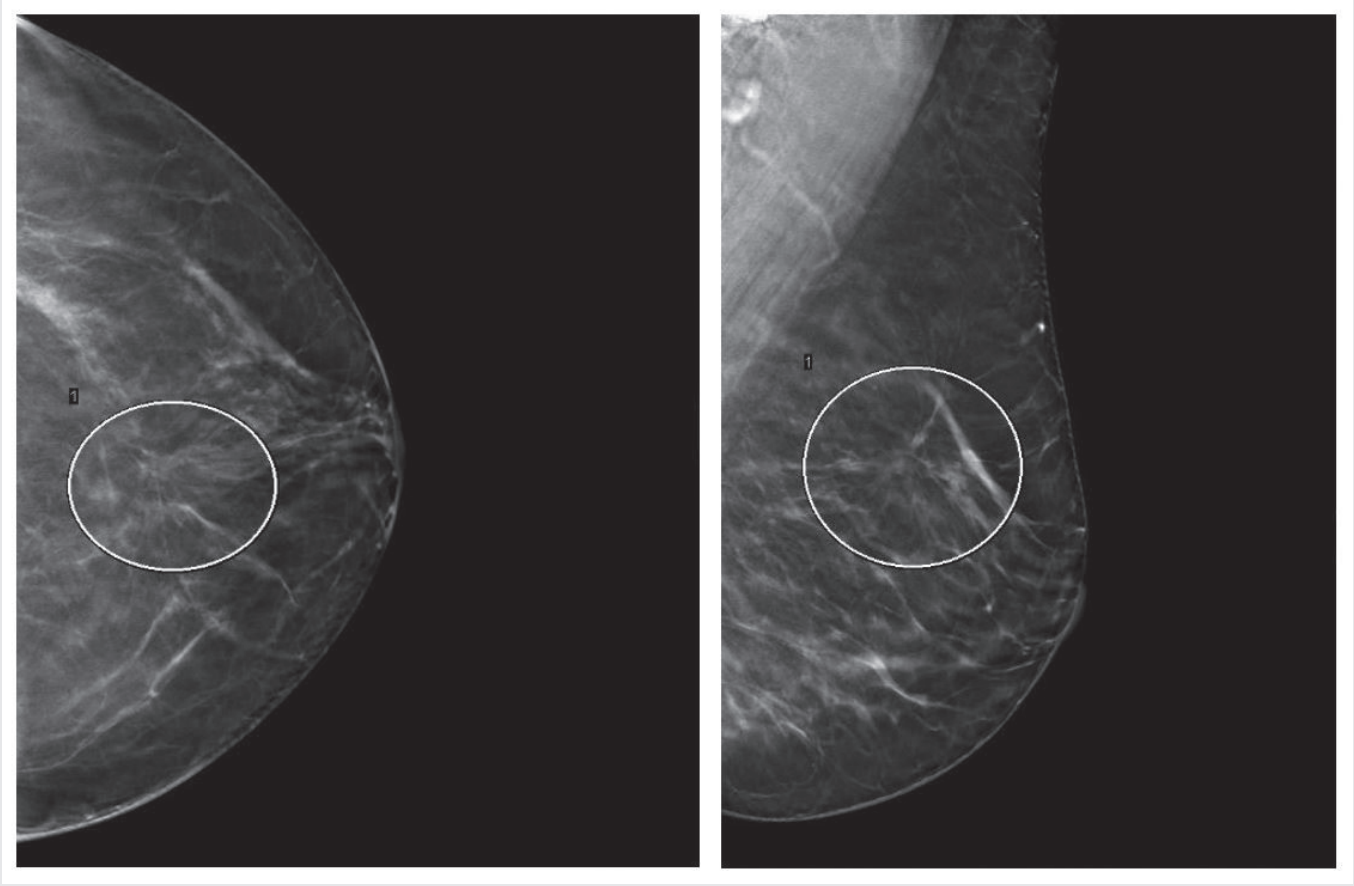

Figure SM2. L CC and L MLO DBT slices clearly showing architectural distortion.

Scar Marking

When the patient returns for additional imaging she remembers a previous surgery. Linear scar marker (TomoSPOT® REF 783, Beekley Medical®) was applied. The 2D spot compression views shown in Figure SM3 show the scar marker and the adjacent architectural distortion.

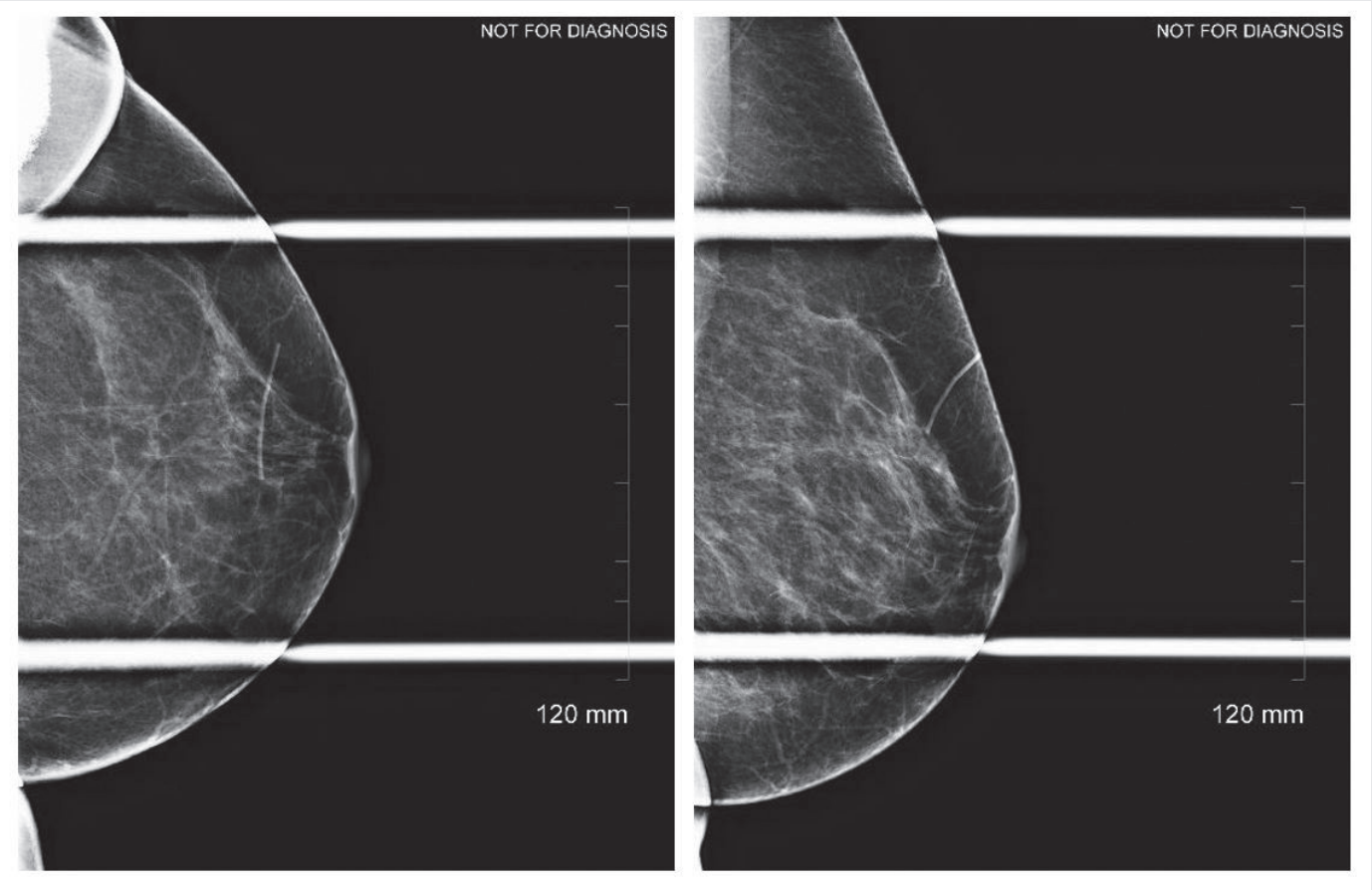

Figure SM3. Architectural distortion adjacent to linear scar marker. L MLO view.

Scar Marking

The linear scar marker and the adjacent architectural distortion can be seen in the L CC and L MLO DBT slices (see Figure SM4).

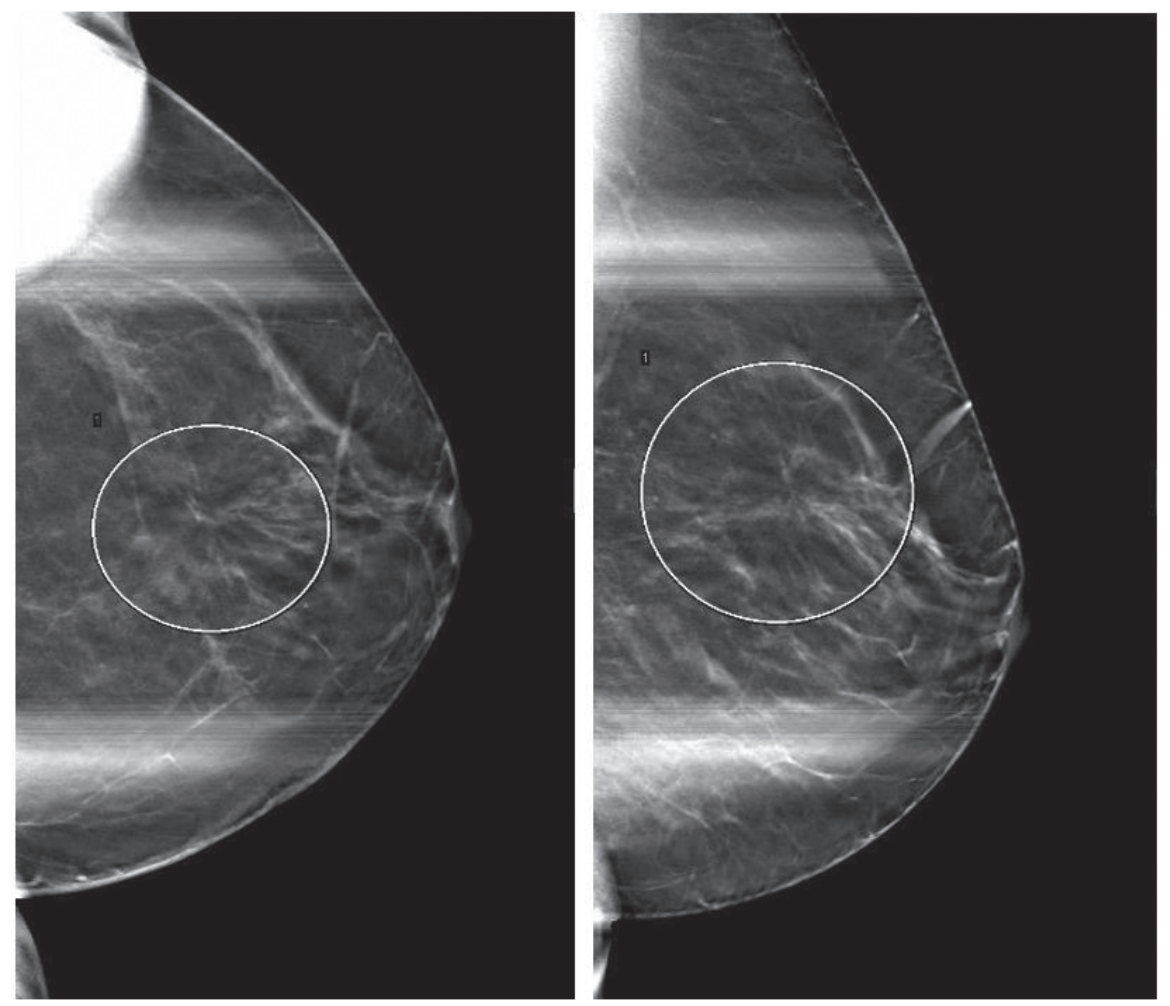

Figure SM4. L CC and L MLO DBT slices show marker and adjacent architectural distortion.

Why were scar markers important?

- **REDUCED UNNECESSARY DIAGNOSTIC TESTS:** Without the pertinent surgical history and the scar marker this patient would have gone to ultrasound and if there was nothing to explain the distortion on ultrasound then she would have gone on to stereotactic biopsy.
- **REDUCED ADDITIONAL IMAGING:** The use of the scar marker prevented unnecessary additional imaging and minimized unwarranted patient anxiety.
- **CONCORDANCE:** Use of scar markers supports better correlation of the surgical history and mammographic findings.
- **PERMANENT DOCUMENTATION:** Routine and consistent placement of the scar marker will assure that a reference point to the area of prior surgery is maintained from year to year.

Palpable Mass Marking

Case Summary

69-year-old female presented for screening mammography. The patient reported non-tender palpable lumps in the right breast. A four view screening mammogram was first obtained without skin markers. For the diagnostic mammogram, the right CC and MLO views were repeated with lucent triangles (TomoSPOT® REF 784, Beekley Medical®) placed over the two palpable lumps in the lateral superior right breast (see Figure PMM1).

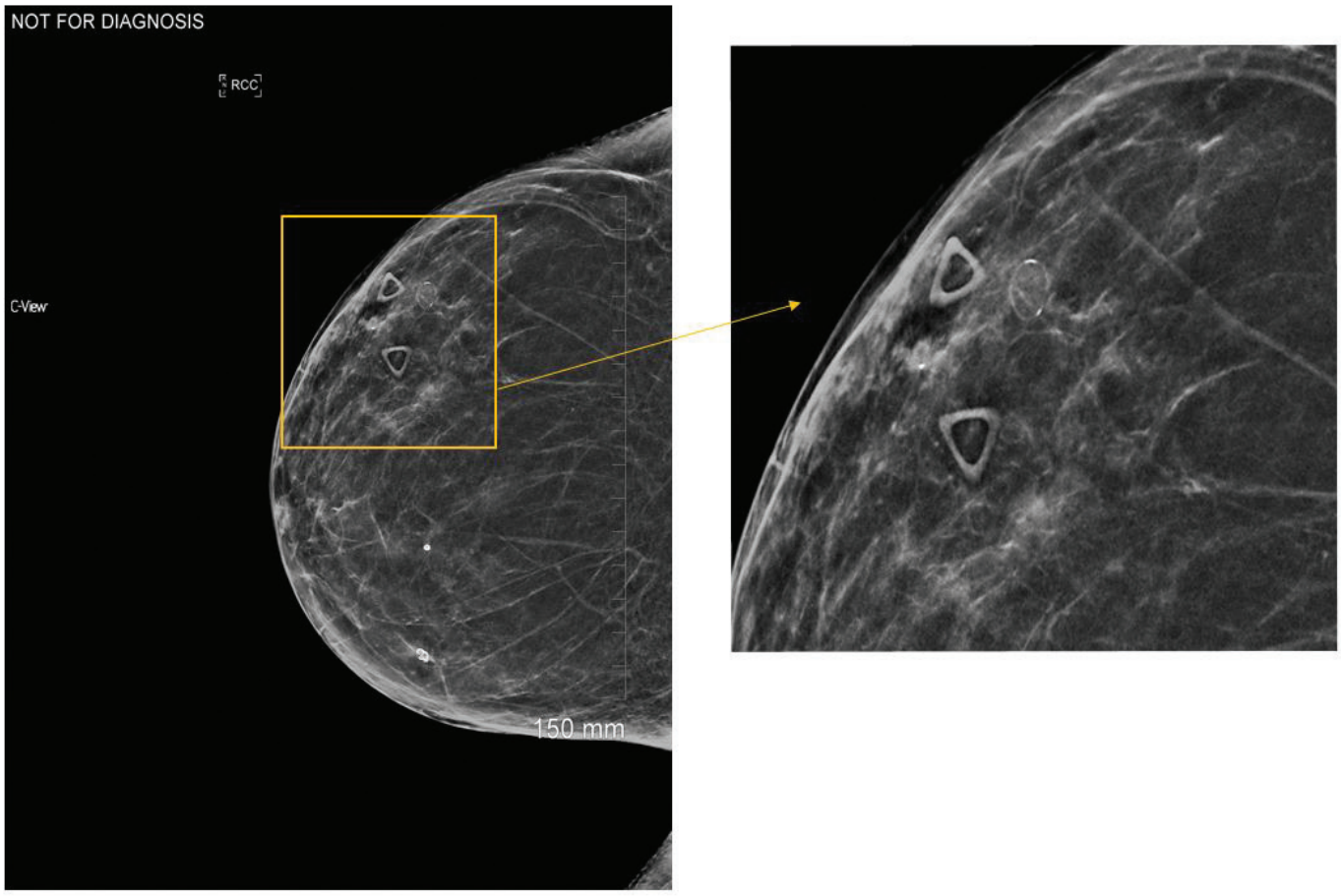

Figure PMM1. CC view from DBT. Both markers can be seen well, underlying tissue detail is clearly visible.

Palpable Mass Marking

The lateral skin marker is imaged in tangent but can still be identified due to the raised profile of the marker which allows for easy visualization (see Figure PMM2). A flat marker would be prone to burnout or could image as a line which could be difficult to see.

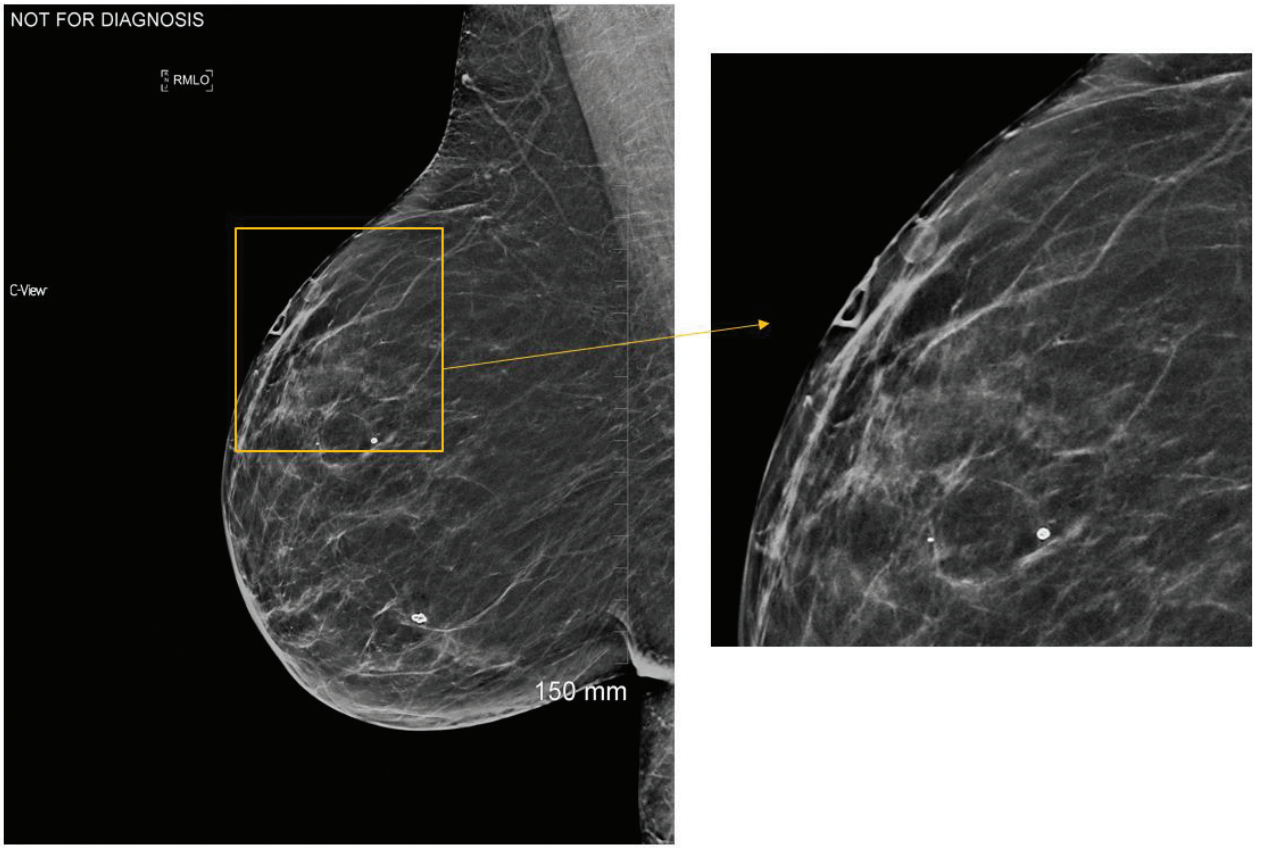

Figure PMM2. MLO view from DBT. Raised profile of the marker makes it easy to see even in tangent.

Why were palpable mass markers important?

- **ACCURACY:** Markers aided in the final diagnosis of benign fat necrosis related to small oil cysts, which can be easily overlooked mammographically and can be difficult for the ultrasound technologist to locate.
- **TIME SAVINGS:** Marking any palpable lump helps the radiologist immediately correlate the physical exam finding with the imaging finding, which in turn saves time and increases specificity.
- **EFFICIENCY:** The triangular shape of the marker immediately directs attention to the area of interest.
- **CLARITY:** The presence of the palpable mass marker on the image provides documentation that the palpable abnormality is included in the image.
- **PERMANENT DOCUMENTATION:** This information becomes part of the patient's permanent record, which is particularly important if images are transferred to another location.
- **PATIENT SATISFACTION:** Use of skin markers reassures the patient that the attention is on their area of concern.

Point of Pain Marking

Case Summary

53-year-old patient presented for screening mammography. History of focal breast pain in the upper outer quadrant of left breast. The patient was able to point to the area of pain. Lucent square marker (TomoSPOT® REF 785, Beekley Medical®) was placed over the area of concern (see Figure POP1).

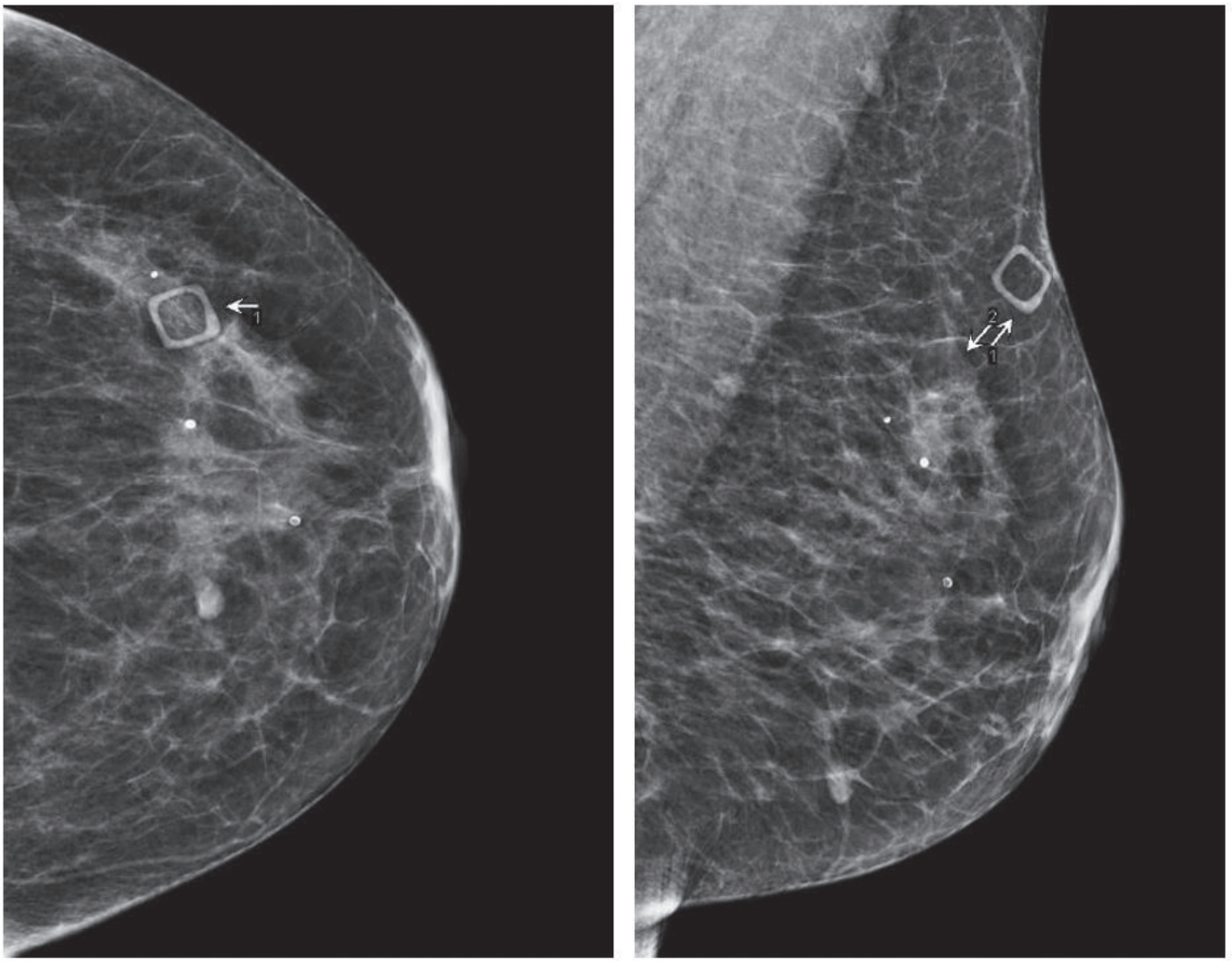

Figure POP1. L CC and L MLO from screening mammography with square marker identifying area of pain.

Point of Pain Marking

Figure POP2 shows the DBT images with several calcifications in the area of the reported pain as indicated by the marker.

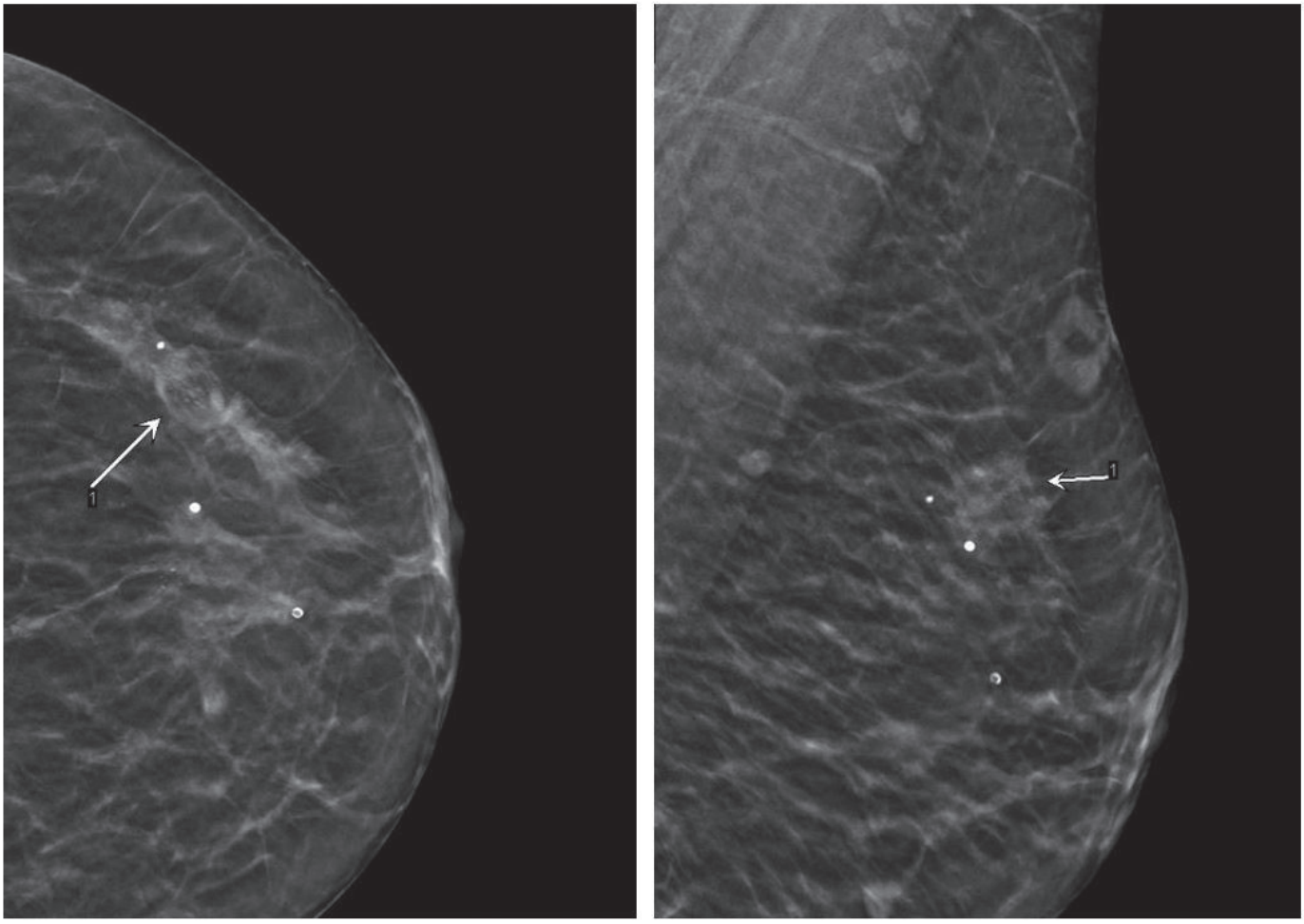

Figure POP2. L CC and L MLO views showing calcifications in area of square marker.

Point of Pain Marking

Diagnostic breast ultrasound was performed (see Figure POP3) which showed a suspicious mass and calcifications. The patient then underwent ultrasound guided core biopsy which demonstrated ductal carcinoma in situ (DCIS).

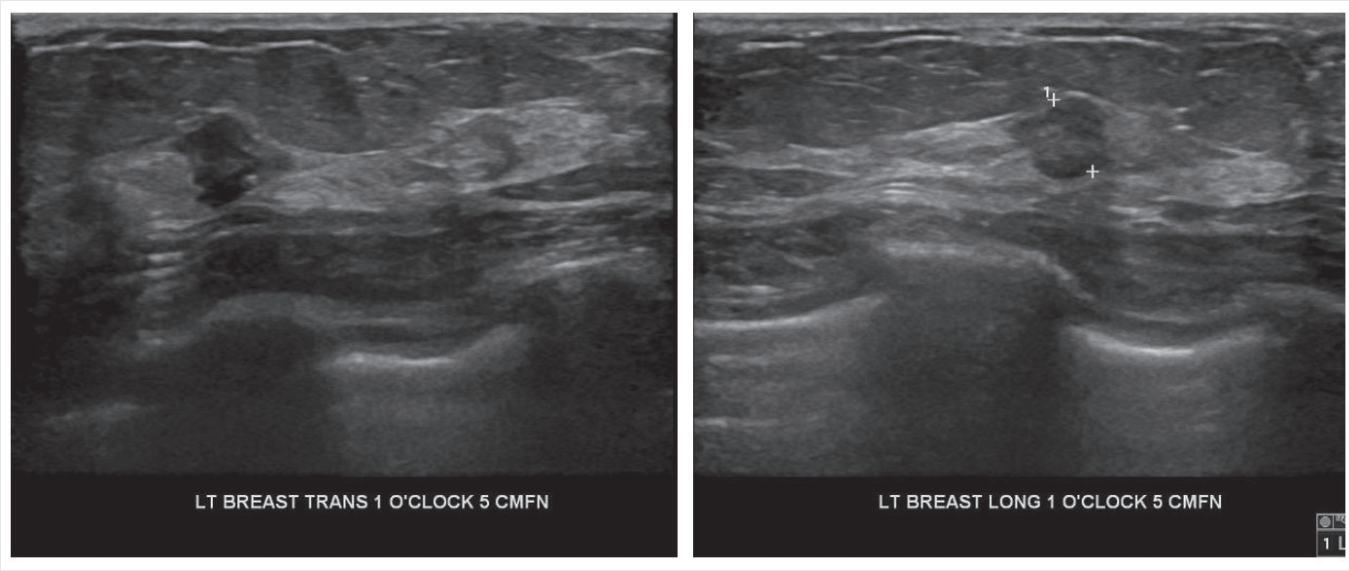

Figure POP3. L breast ultrasound images. Presence of marker resulted in quicker and easier location of mass and allowed ultrasound guided biopsy rather than stereotactic biopsy to be performed.

Why were point of pain markers important?

- **CONCORDANCE:** Use of square marker facilitated correlation between patient-reported symptoms and imaging findings.
- **GUIDED DIAGNOSTIC DECISION MAKING:** The marker allowed the radiologist to readily locate the area of interest and drove the decision to perform an ultrasound guided biopsy rather than a stereotactic biopsy. Without the marker, the radiologist would only have had the presence of an area of increased density and a few calcifications to guide the decision.

Concluding Remarks

Shaped, raised markers have many important benefits in DBT

Using the Beekley Skin Marking System® for Mammography benefits radiologists like myself in many ways.

We consistently use all five markers to identify palpable masses, moles or other raised areas on the skin, surgical scars, areas of focal pain, and nipples.

The distinctive shape of each marker helps us focus our attention appropriately, increases confidence in what we are seeing, and reduces interpretation time by minimizing the need to investigate old mammograms. In addition, they provide important documentation and improve patient satisfaction.

Consistent use of marking system improves efficiency, helps focus attention

Consistency in skin marking is something we often talk about, especially since we have multiple facilities. While every facility wants to do things their own way, it's the same group of radiologists reading for all sites.

That consistency is very important because every second counts when you're reading and it's important for our efficiency that when you open a study, the information is presented the same way each time.

We expect consistent protocols to be used and we like to see a uniform history form. We also want areas that we're marking to be the same across our sites so that we can quickly and easily identify the area of concern. Conversely, with some of the markers you are identifying something that is clearly benign so that you can focus your attention elsewhere.

That specificity of the shaped markers definitely helps you efficiently focus your attention. What you really want is a dependable method to identify those areas so that you know what you need to focus on or what you're seeing.

That's why the shape system works so well. I utilize the same search pattern when reading every mammogram. That's really important for my efficiency.

When I look at outside images from a study performed at another facility that doesn't use a specific shape system for marking, you have to try to figure out what the BB is supposed to indicate and it can be very confusing.

The last thing we need when a patient has been worked up elsewhere and then comes here is confusion. You definitely remember the cases where the markers are not used because those are the ones that make you spend extra time.

It's also very important to use the markers consistently and in all areas where they are appropriate. We used to hear all the time: "I only mark the moles I think are going to be on the image," which is so risky. Our technologists now use mole markers whenever they notice any raised area on the skin.

Skin marking successfully adopted across all facilities

We spoke with the imaging leadership at each of our facilities to get everyone on board. We told them "It's something we do at Facility X, it really works, and we want to bring it over here to Facility Y." We were looking at establishing and maintaining consistency so it's not just a sporadic practice.

That said, using all five skin markers was well accepted throughout our institution.

I find that a lot of times our technologists like having structure and set protocols rather than having to do it differently for different radiologists. I count on the tech leadership and the more experienced techs to reinforce consistent use of the markers.

Skin markers help reduce recalls

I remember a case with surgical scarring where a biopsy was recommended for an area of architectural distortion. I looked at it with one of the other radiologists and found some information showing the scar markers. The patient would have gone on to a biopsy if we didn't know there was scarring.

Unfortunately it's not uncommon to see recalls for scarring, moles, and out of profile nipples. A recall is disturbing for patients and is a waste of time and money for everybody.

As another example, we had a case where the patient had very tiny skin tags in the inferior breast which led to a recall. When the patient returned, even though we said these may just be areas on the skin and not a concern, the technologist didn't mark anything because she didn't see anything. I went in and saw the skin tags and suggested they be marked.

Most of the time we're looking for bigger skin lesions but in this case, these were tiny asymmetries that showed up mammographically on the tomosynthesis images. The technologists didn't even know that they would show on the images. That's one example of why it's important to consistently use the markers.

Patients appreciate when skin markers are used

The use of skin markers increases confidence from the patient's perspective as well.

Patients appreciate anything we do that individualizes their examination and shows that we are taking the time to go through their history, to mark scars, moles, etc. We tell patients when there is something that might show up as a mass on a mammogram but is not a concern. It also helps guide the technologists when we have a protocol that says we need to mark these scars and we need to mark these moles and we need to pay attention to the nipple.

I think patients pick up on when you're spending the time and doing things the right way. Our focus is always on providing the best patient care we can and striving for excellent outcomes. It's important for patients to feel we go that extra mile.

Joseph C. Benjamin, MD is a specialist in Breast Imaging and Lead Interpreting Physician for three Breast Centers at Mercy Health in Cincinnati, Ohio. He completed his residency and fellowship at the University of Pittsburgh Medical Center (UPMC) and has authored several papers on the topics of breast imaging. Dr. Benjamin is a member of the American College of Radiology, Ohio Radiological Society and the Society of Breast Imaging. He is a 2018 recipient of the Beekley Medical® EMPOWER Award.

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