

Diagnosis of US/MRI-occult asymptomatic multifocal invasive lobular carcinoma using breast tomosynthesis

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Background

In February 2011, the U.S. Food and Drug Administration (FDA) approved the use of breast tomosynthesis for use in breast cancer screening and diagnosis. A tomosynthesis data set is produced by obtaining 15 low-dose tomographic images of the breast at multiple angles across a 15° arc. These images are then reconstructed into 1 mm slices for viewing on a diagnostic workstation.

The distinct advantage of tomosynthesis is a significant reduction in the number of “pseudo lesions” or false-positives recalled from screening mammography that are simply superimposed breast tissue appearing as an abnormality on a traditional 2D mammogram.

A tomo data set allows the radiologist to detect and define lesion borders and areas of architectural distortion much more readily than on 2D images because overlap by surrounding breast tissue is virtually eliminated. Clinical experience with this modality at our institution supports the early clinical reports provided by the manufacturer (Hologic, Inc, Bedford, MA) suggesting a significant increase in mammographic specificity without a loss in sensitivity.¹

Although invasive lobular carcinoma (ILC) comprises only about 5% to 15% of breast carcinomas, the incidence has been steadily increasing in the last two decades, especially in the 50 and older age group.² Classic invasive lobular carcinoma has a highly infiltrative growth pattern, spreading throughout the surrounding stroma in single file, often allowing it to become extensive before becoming palpable or detectable by imaging studies. Therefore, it is often a challenging clinical and imaging diagnosis.

Patient Information

Our patient is an asymptomatic 56 year old female with no personal history of breast cancer. Her family history is notable for breast cancer diagnosis in her sister at 55 years of age and a maternal great aunt who was post menopause when diagnosed with breast cancer. She is G2 P2 with the first pregnancy at age 28 and menarche at age 12. Due to her perimenopausal symptoms, she has used estrogen HRT for the last 8-10 years. She was recalled from routine annual screening 2D mammography for an ill-defined asymmetry in the left upper breast, seen only on the MLO view, within a background of heterogeneously dense breast tissue (Figure 1).

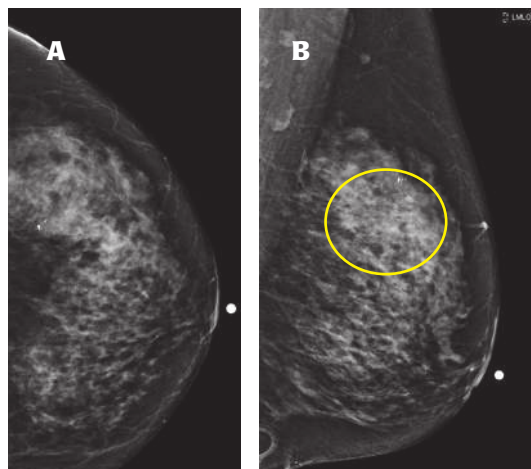


Figure 1. (A) 2-dimensional digital screening mammogram. No correlate lesion was seen on the CC view. (B) shows a dense asymmetry in the upper left breast (circle).

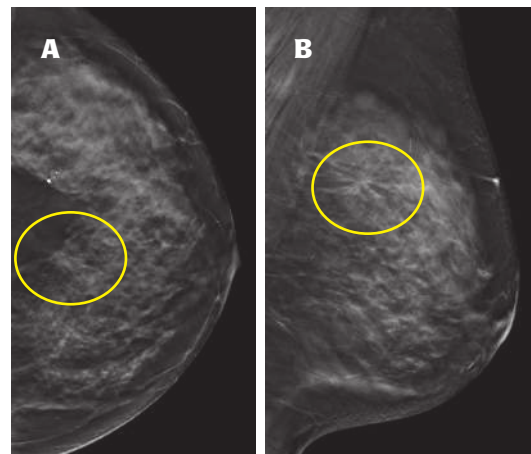


Figure 2. Breast tomosynthesis. (A) Tomo LCC slice shows a spiculated lesion in the mid retroareolar posterior third left breast (circle). (B) Tomo LMLO shows a spiculated lesion in the upper left breast (circle).

Imaging Findings

Breast tomosynthesis was performed as part of our current diagnostic protocol using the Hologic Selenia Dimensions unit. The tomosynthesis CC and MLO images clearly delineate a spiculated mass in the upper mid left breast (Figure 2). Subsequent targeted ultrasound was performed which revealed normal breast echotexture with no focal abnormality in this region.

Because of the very suspicious nature of this lesion on tomosynthesis, contrast-enhanced breast MRI was performed on a 3T Siemens Trio™, ACR-accredited for breast imaging. No abnormal enhancement was

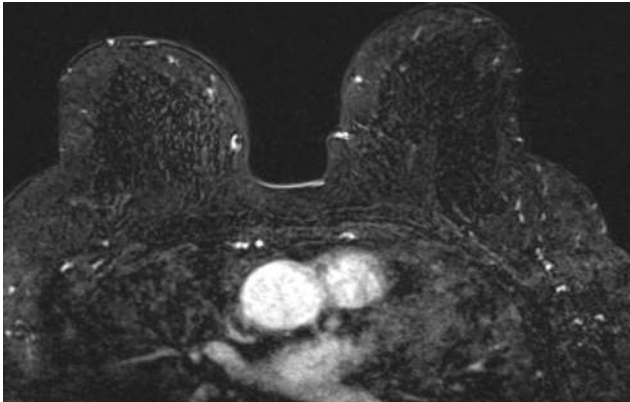


Figure 3. MRI exam. Contrast-enhanced subtraction MR image upper left breast in the area of concern based on tomo views shows no abnormal enhancement.

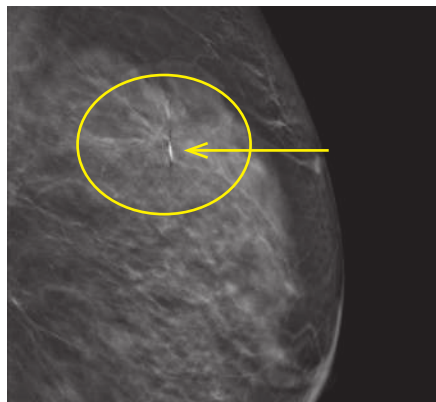


Figure 4. Tomosynthesis image slice showing placement of I-125 radioactive seed next to spiculated lesion in LLM view. (circle)

present in either breast, and there was very minimal background glandular enhancement (Figure 3).

Because no definitive target for biopsy could be identified for stereotactic, MR or ultrasound guidance, I-125 seed-localized surgical lumpectomy was recommended. The lesion was only clearly seen on tomosynthesis, therefore, the stereo-localization with 2D images was challenging. However, by performing a true lateral tomosynthesis view along with the orthogonal tomosynthesis CC view, placement of the seed adjacent to the spiculated mass was performed using a typical localization compression paddle with grid line markers.

The CC and LM tomosynthesis key images were placed next to the 2D mammographic localization images for estimation of the location of the lesion. The breast was placed in the CC position, and an 18 gauge needle was placed in the approximate area of the spiculated lesion seen on tomosynthesis. The breast was then placed in LM position and the needle tip was withdrawn to the level of the area of the spiculated lesion seen on tomosynthesis. The I-125 seed was deposited in this location successfully. Post-seed placement tomosynthesis in both planes confirmed accurate targeting of the lesion within 1 cm (Figure 4).

Diagnosis

Grossly, the lumpectomy had firm, white, somewhat translucent fibrotic parenchyma comprising approximately 85% of the specimen. Microscopically, multiple foci of invasive lobular carcinoma, ranging in size from less than 1 mm to 8 mm in greatest dimension, were scattered throughout most of the specimen. Tumor foci were within 1 mm of several margins. Multiple foci of lobular carcinoma in situ were also present. Pathologic staging was pT1b(m) N0, ER/PR positive, HER-2/neu negative.

Treatment

The patient subsequently underwent re-excision of the tumor bed and was found to have a few microscopic foci of invasive lobular carcinoma with

microcalcifications, but margins were adequate and free of tumor. She had 0/1 sentinel lymph nodes on biopsy.

Post-operatively the patient has done well. Radiation oncology has recommended adjuvant radiation to the left breast and axilla to optimize local control and disease specific survival. Hematology/Oncology has been consulted for further treatment recommendations.

Discussion

This case demonstrates the profound impact tomosynthesis breast imaging provides for early breast cancer detection. In this case, an abnormality was detected on 2D mammography, but the highly suspicious characteristics and definitive location of the lesion were clearly defined only on the tomo views. Specifically, contrast-enhanced MR has been established as a very sensitive and useful tool for ILC detection and determining extent of disease prior to treatment.³ This case report exhibits the clinical utility of tomosynthesis, especially in the absence of abnormal MR enhancement. Ultimately, the use of conventional 2D imaging alone, in this particular patient, may have led to a delayed diagnosis of primary breast malignancy.

Conclusion

Tomosynthesis is quickly becoming an extremely valuable imaging modality for early breast cancer detection. The use in the general screening population increases the radiologist's overall accuracy. Our own experience illustrates an increased specificity and shows a trend for increased sensitivity. In addition, tomosynthesis imaging is proving to be a powerful tool for breast cancer detection in those at high risk for developing breast cancer, such as in this patient with a significant family history for breast cancer and dense breast tissue on mammography.

The Hologic Selenia Dimensions clinical studies were presented to the FDA as part of Hologic's PMA (P080003) submission that compared Hologic's Selenia Dimensions 2D + tomosynthesis to Hologic's 2D FFDM.

References

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