Use of MRI in Detecting Clinically and Mammographically Occult Ductal Carcinoma In Situ. Two Case Reports

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Use of MRI in Detecting Clinically and Mammographically Occult Ductal Carcinoma In Situ. Two Case Reports*

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Abstract

We would like to report on two cases where breast MRI examination has changed clinical management. Breast MRI is now recognized as an indispensable adjunctive examination to mammography and ultrasound.

In each of the two cases described, breast MRI had shown unsuspected extensive mammographic and ultrasound occult ductal carcinoma in situ (DCIS). In each of these cases, the planned breast conserving surgery was changed to mastectomy. The success of breast conservation treatment depends on removal of all tumor with clear margins at the time of surgery. MRI is now considered to be the most sensitive method to evaluate the extent of breast cancer. Breast MRI has very high sensitivity for invasive carcinoma (near 100%), and recent studies show the specificity of high-risk patients at 93–99%. MRI may well prove to be an important adjunctive examination in patients who have dense breasts or extensive fibrocystic change.

Introduction

Although breast MRI has been available for over a decade, it is only recently becoming recognized as an indispensable adjunct to examination of the breast after mammography and ultrasound. Several key factors contribute to this, Firstly, breast MRI protocol is approaching standardization. Secondly, high resolution images are now routinely obtained with 1.5 Tesla and especially with 3 Tesla scanners. Thirdly, MRI breast biopsy devices are now commercially available. Most breast MRI examinations are completed in 30 minutes. Since November 2005, we have been performing breast MRI examinations on a 3 Tesla MRI scanner. 3 Tesla imaging gives increased signal to noise compared to 1.5 Tesla scanners. In addition, it performs well with parallel imaging techniques (iPAT) which gives very high resolution images without increasing the scan time.

Case 1

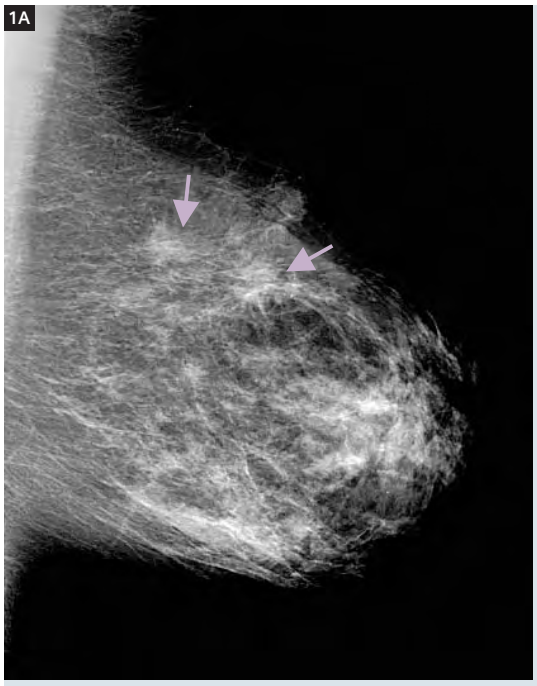
A 52-year-old female first noticed some thickening in the left breast upper outer quadrant in 2003. Mammogram and ultrasound at that time was normal. Increasing density was noted in May 2005 but ultrasound showed no particular masses. In November 2006 a repeat mammogram showed two areas of opacity in the upper outer quadrant (Fig. 1A). Breast ultrasound was entirely normal (Fig. 1B). Physical examination showed mild thickening at the left 2 o'clock. Fine-needle aspiration (FNA) of the thickening however showed cancer cells. Core needle biopsy confirmed invasive ductal carcinoma. In view of the discordant findings between mammogram and ultrasound, breast MRI was performed to exclude multicentric disease. MRI scan showed 2 spiculated masses in the upper outer quadrant corresponding to the areas of architectural distortion on the mammogram (Fig. 1C). These masses measured 0.7 x 1.5 x 1.3 cm and 0.8 x 1.5 x 1 cm. The signal intensity-time graph showed rapid uptake of contrast with washout for lesion 1 and rapid uptake of contrast with plateau for lesion 2. These features are diagnostic of carcinoma.

Separate from these 2 lesions, there is a large segmental area with nodular and linear clumped enhancement through-out the lower quadrant of the left breast. These findings are compatible with extensive DCIS with and without invasive component (Fig. 1D).

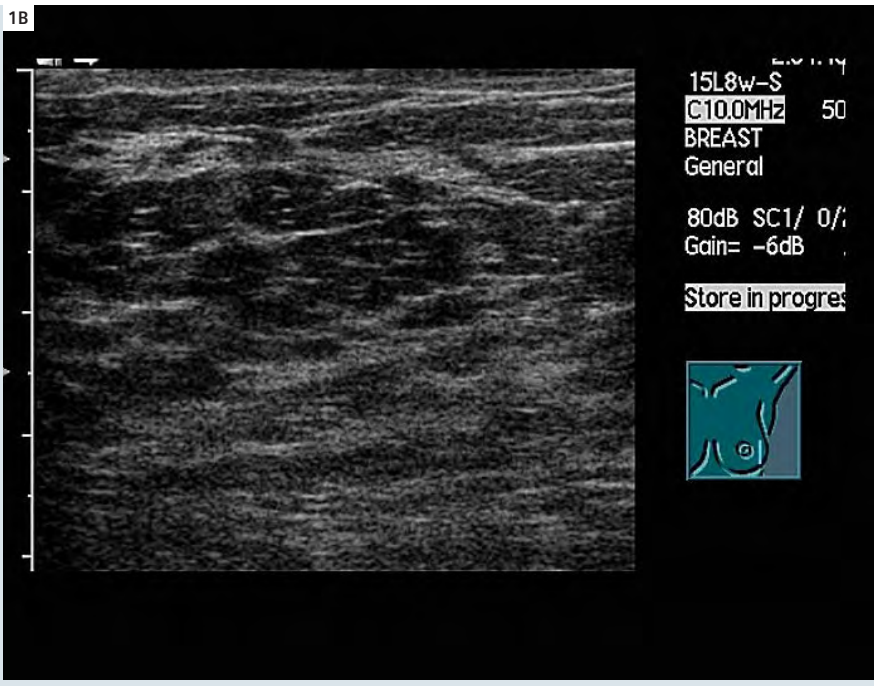
Because of the extensive and multicentric disease seen on MRI, the initially planned breast conserving surgery was switched to mastectomy.

The patient underwent left skin sparing total mastectomy, sentinel node biopsy, axillary dissection and transverse rectus abdominis muculocutaneous (TRAM) flap reconstruction in January 2007. Pathology showed extensive intraduct carcinoma (EIC) measuring 7 cm in diameter, with 5 foci of invasion, largest measuring 1.8 cm grade II, multifocal lymphovascular invasion, 2 of the resected axillary nodes showed metastasis.

In summary the patient had stage IIA carcinoma of left breast $T1_{c(m)}N_1aM_0$ ER200 PR200 PI 6% c-erbB2 w+. She received adjuvant chemotherapy, radiotherapy and hormonal therapy following surgery.

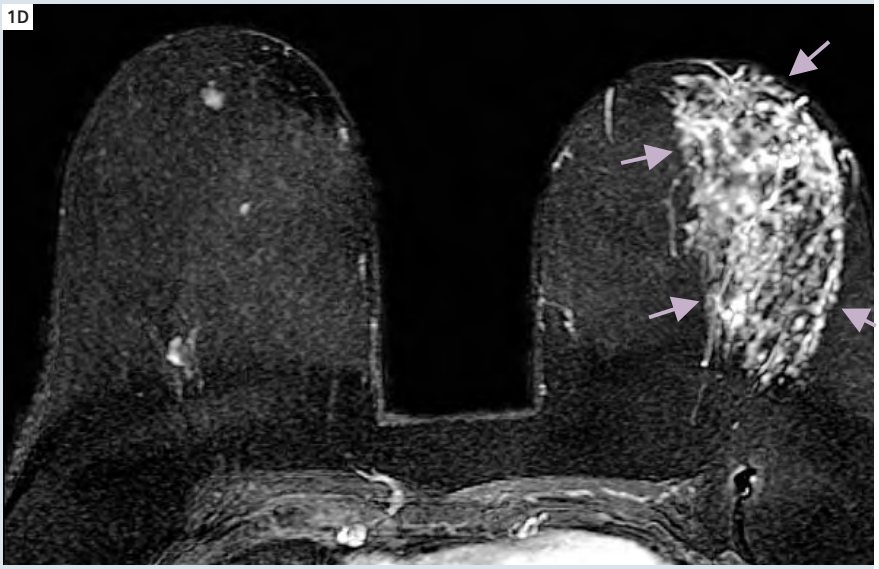


1A Left MLO mammogram shows 2 opacities in the upper quadrant of the left breast.



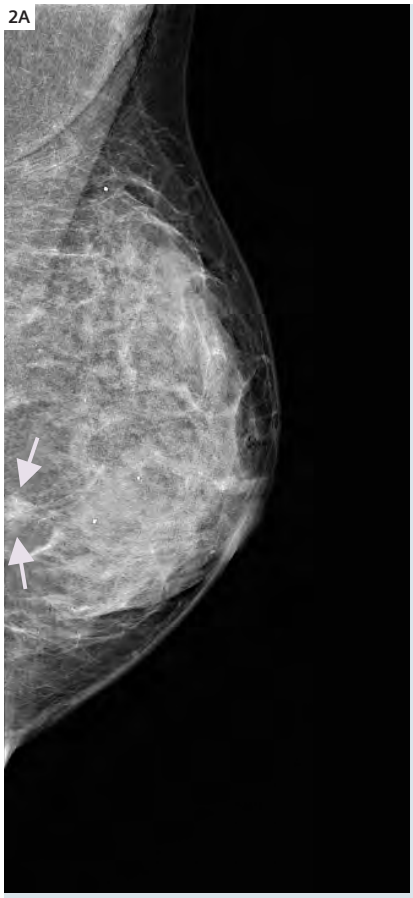
1B Ultrasound of the left breast is normal.

1C MRI: post-contrast sagittal T1-weighted image with fat saturation shows 2 spiculated masses in the upper quadrant and segmental enhancement in the lower quadrant.

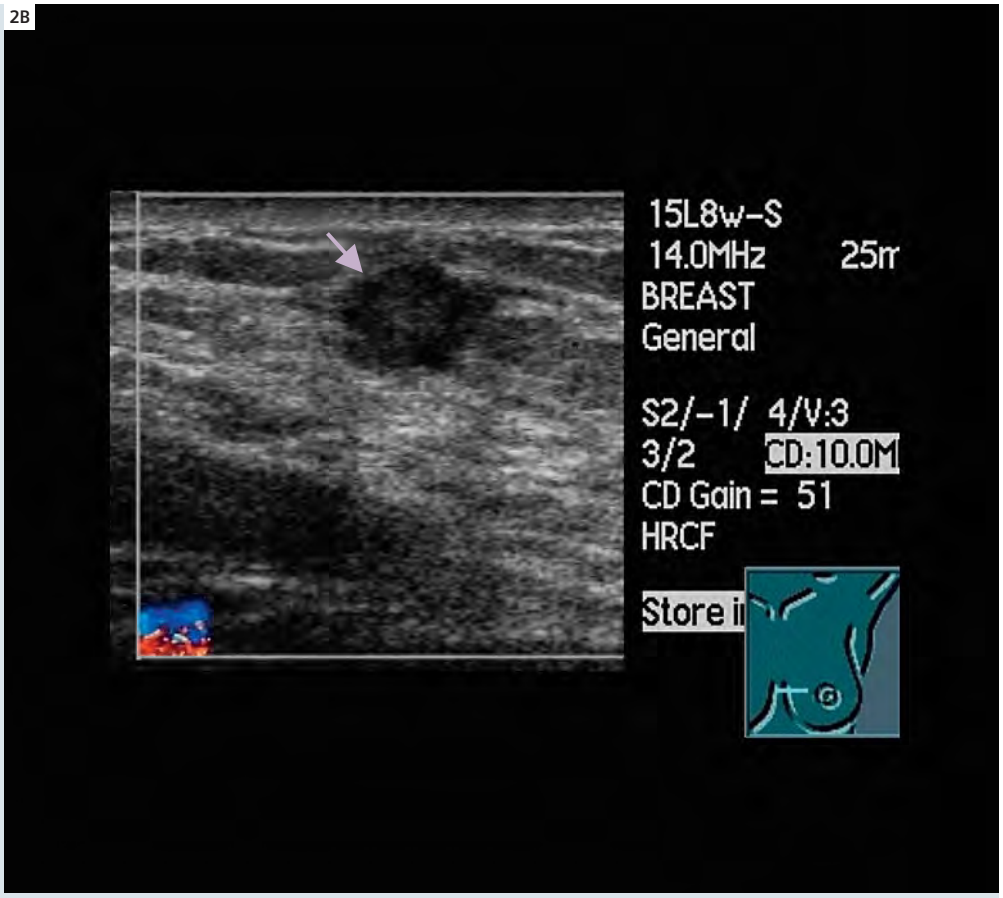


1D MRI: post-contrast axial T1-weighted subtracted scan shows segmental linear and nodular clumped enhancement in lower outer quadrant of the left breast.

2A



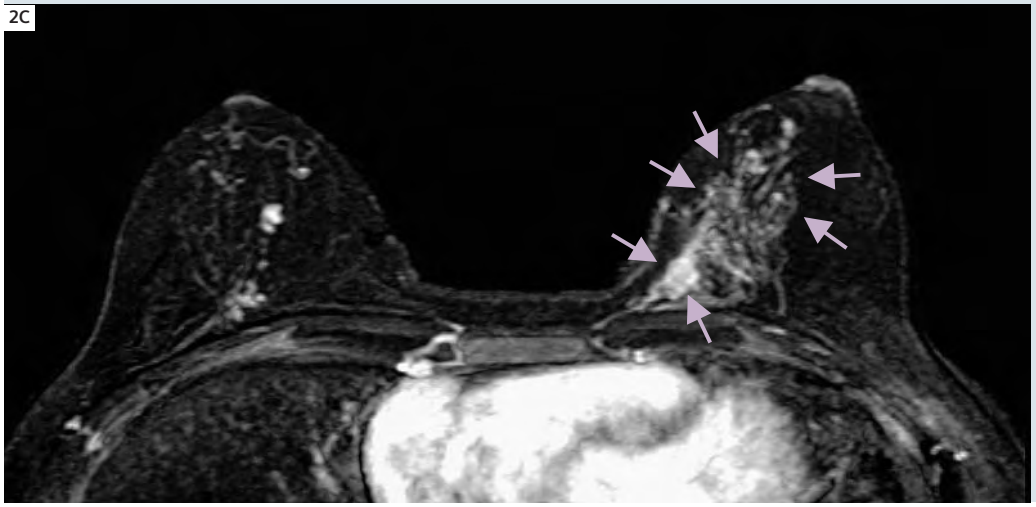
2B



2A Left MLO mammogram shows asymmetric density at 9 o'clock.

2B Ultrasound of the left breast shows hypoechoic mass at 9 o'clock.

2C



2C Post-contrast axial T1-weighted image with fat saturation shows at 9 o'clock a rim enhancing mass and segmental linear enhancement at the medial lower quadrant of the left breast.

Case 2

A 37-year-old female first noticed a left breast lump in January 2007. The mammogram showed asymmetric density in the left breast at 9 o'clock position with bilateral scattered benign and coarse microcalcifications in both breasts (Fig. 2A). Ultrasound showed a hypoechoic shadow measuring 8 x 6 x 8 mm at 9 o'clock position of the left breast (Fig. 2B) with a cyst at 10 o'clock position. There is also a cyst in the right breast. The left 9 o'clock mass on ultrasound was highly suspicious for cancer and was also confirmed on FNA. In view of the surrounding benign appearing shadow on ultrasound, breast MRI was performed which showed the index lesion in the left breast at 9 o'clock position to be highly compatible with carcinoma, measuring 1.1 cm. It also showed extensive intraductal enhancement involving 6 o'clock to 10 o'clock area measuring 2.3 x 6 cm (Fig. 2C). Because of the MRI findings, the initially planned umpectomy was changed to mastectomy. Left skin sparing total mastectomy and sentinel node biopsy with TRAM flap reconstruction was performed in February 2007. Pathology showed 0.8 cm grade III invasive ductal carcinoma at L9h position, associated with an 8 x 2.8 x 1.3 cm area of ductal carcinoma in situ (DCIS), sentinel node biopsy was negative for metastasis. In summary the patient had stage I carcinoma of the left breast $T_{1b}N_0M_0$ ER170 PR180 PI 8% c-erbB2 strongly+. She was put on Tamoxifen as adjuvant therapy.

Discussion

The success of breast conservation treatment depends on removal of all tumor with clear margins at the time of surgery. Any residual tumor will increase the chance of recurrence even after radiation therapy [1]. Surgeons are sometimes faced with reoperations on patients who appear to be suitable for breast conserving surgery with clinical, mammographic and ultrasound assessments. Often, these are intraduct carcinoma with no apparent mass formation and do not produce microcalcifications on mammogram. Multifocal (more than 1 tumor in 1 quadrant) and multicentric tumor (tumor in more than 1 quadrant) occur in 6 to 34% of breast cancer cases [2].
MRI is now considered to be the most sensitive method to evaluate the extent of breast cancer [3]. It is superior to mammography and ultrasound. Breast MRI has very high sensitivity of 90% or more for breast cancer and near 100% sensitivity for invasive breast carcinoma [4, 5]. Recent literature studying high risk groups such as those with BRCA1 and BRCA2 genes show specificity of 93 to 99% [6]. This is achieved by using a dedicated breast coil and meticulous techniques. Lesions are analyzed by their morphology as well as their enhancement characteristics [7, 8]. The sensitivity of MRI in detecting DCIS is lower probably because of various subtypes. Menell and colleagues report a sensitivity of 88% [9]. Traditionally mammography has been used to evaluate DCIS showing areas of suspicious microcalcifications. However, mammography frequently underestimates the size of tumor and as much as 60% of breast cancer do not form microcalcifications. MRI can detect DCIS with microcalcifications as well as DCIS without microcalcifications. In the two cases presented, the areas of extent DCIS did not show any microcalcification and were mammographic and ultrasound occult. Our two case reports illustrate the use of breast MRI to fully evaluate the extent of breast cancer before definitive surgery, thus avoiding multiple reoperations due to unexpected positive tumor margins from clinically occult extensive DCIS.

Conclusion

It is yet to be evaluated whether MRI should be a routine procedure before all breast cancer surgery. It may prove to be a useful adjunct in preoperative assessment in young breast cancer patients who often have dense breasts, where mammographic accuracy is reduced. It may also be useful in patients with fibrocystic breast change, showing multiple indeterminate shadows on ultrasound, as illustrated in Case Two. When there are discordant findings on clinical, mammographic and ultrasound appearance, MRI will provide more information on breast cancer assessment, as illustrated in Case One. The cost of breast MRI may be a concern. However, the cost becomes insignificant compared to multiple reoperations.

*Some of the concepts and information presented in this paper are based on research and are not commercially available in the U.S.

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