

Case Report

Open Access, Volume 2

Breast MRI in the setting of breast carcinoma with suspected microcalcifications and his predictive value in breast cancer management: An interesting case report

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Abstract

The Breast Imaging Reporting and Data System (BI-RADS[®]) is a standardized system of reporting breast pathology used also for Magnetic Resonance Imaging (MRI). It facilitates clear communication between the radiologist and other physicians as surgeons involved in senology, by providing a lexicon that compares breast gland structures to assessment categories in the management recommendations for the onco-surgical choices.

In 30% of all clinical cases in women, breast cancer is correlated to micro-calcifications [1] or occulted lesion as non-palpable nodule and this diagnostic management is not easy, especially if you haven't an easy access to all the equipment of interventional methods as stereotactic biopsy or radio-pharmacological detection's method (for example R.O.L.L., Radioguided Occult Breast Lesion Location), and if you cannot know the real distribution of suspected or malignant micro-calcifications in mammography.

MRI is more accurate than mammography for prediction of residual malignancy after excisional biopsy for breast cancer with suspicious micro-calcifications [2,3].

MRI's report often influences the surgical performance. MRI can be useful to correlate malignant microcalcifications with pathological tumor size and to allow the pre-operative drawing in onco-plastic surgery for breast cancer. MRI might be more reliable for predicting residual tumor size after an onco-plastic surgical procedure or a conservative mastectomy, with significant influence on surgical outcomes and disease free survival and risk of relapse [4,5].

Keywords: Breast cancer; Breast MRI; Microcalcifications; Multidisciplinary consultation; Breast conservative surgery.

Received: Apr 22, 2021

Accepted: May 28, 2021

Published: Jun 02, 2021

Archived: www.jcimcr.org

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Citation: Fava MG, Turano L, Messina F, Plutino MF, Tebala C, et al. Breast MRI in the setting of breast carcinoma with suspected microcalcifications and his predictive value in breast cancer management: An interesting case report. *J Clin Images Med Case Rep.* 2021; 2(3): 1175.

Introduction

MRI of the breast remains controversial as an adjunct to determine candidacy for breast conservation, but prospective randomized clinical trials are underway to define the role of MRI in newly diagnosed breast cancer. Pre- and post-operative imaging' comparison could be necessary to confirm complete removal of all cancer-associated micro-calcifications, with clinical judgment exercised regarding re-excision for close margins. Also, it is important to exclude a multifocal and multicentric neoplasm as a contralateral breast cancer and MRI proves to be a thorough examination for this purpose. The contralateral prophylactic mastectomy is becoming increasingly, especially in categories at high risk with BRCA's mutation.

MRI increases Positive Predictive Value and specificity compared to mammography if there are suspected microcalcifications, as in our case; infact Breast MRI has the potential to improve the diagnosis of the category BI-RADS-4 microcalcifications and could alter indications for biopsy-procedure or conservative surgery [6].

Case report

In our case report we have used a combined test, mammography at first and MRI as second level, for the diagnostic strategy to identify the microcalcifications distribution on inferior-internal quadrant (IIQ) of left side and to decide for a breast conserving therapy for this patient.

The patient (R.M.) underwent to a mammography exam in June 2000 in a private radiological office that reported: "On the IIQ of left side, pathological microcalcifications distributed at range about for 7 cms and in this context a nodule of 15 mms of heteroformative nature" (Figures 1).

The radiologist performed a breast Ultrasound (US) exam too. (Figures 2a-d).

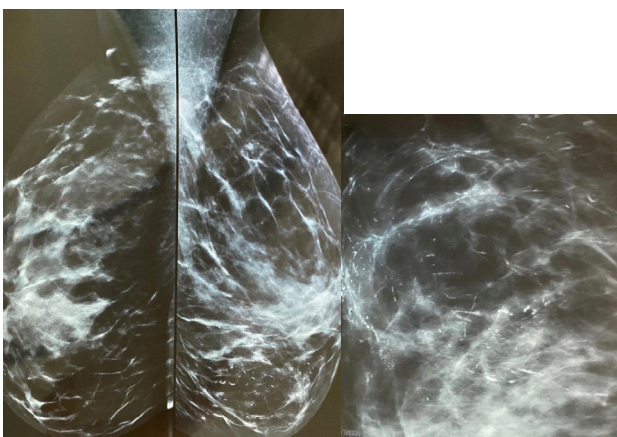


Figure 1: Mammography showed, on the IIQ of left side, the presence of pathological micro-calcifications distributed at range about for 7 cms and in this context a nodule of 15 mms of heteroformative nature.

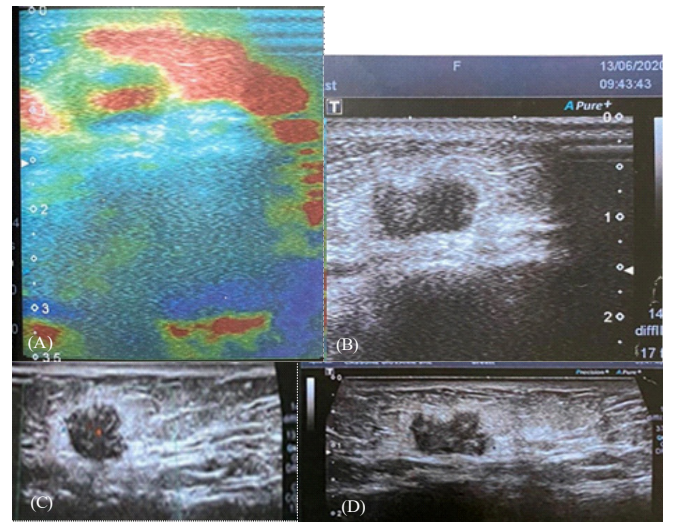


Figure 2a-d: Breast US, performed as a completion of the mammography, confirmed the pathological breast findings.

She did an ultrasound biopsy on the palpable-mass of 15 mms located at the inferior internal quadrant, near the parasternal margin, but the mammography showed an 7 cms extension of the suspected malignant microcalcification on the all IIQ left side without others information. The radiologist did not perform biopsy by stereotaxis of microcalcifications.

The micro-histological exam showed an invasive carcinoma G2, ER +100%, RPg – Mib-1 35-40%, Hercept test ASCO/CAP 2018 2+ or doubtful and the FISH-analysis was positive for amplified profile.

The patient underwent to a breast specialistic and oncologist, and they decided to insert the patient into the diagnostic-therapeutic path for breast cancer in our hospital.

The patient performed MRI of the breast with contrast medium whereas she had not undergone to stereotactic biopsy on the micro-calcifications, before surgical and oncological decision in multidisciplinary consultation.

Breast MRI, compared with Mammography and breast US, had shown the presence in the inferior-internal quadrant (IIQ) of the left breast of suspected micro-calcifications (but not clearly malignant), that are scattered in an area of 7 cms; in this context, a 15 mms heteroformative nodule was identified. The breasts appeared with mixed structure and glandular prevalence, with an asymmetrical back-ground enhancement. In the left side, in the IIQ left side, in deep seat, a mass-like of 13 X 7 mms about, with uneven enhancement, with vascular pole on the lateral side and not definitely dissociable from the chest wall (BI RADS 5), was identified. In the superior-internal quadrant (SIQ), there is a focus of early enhancement of 5 mms, of longitudinal morphology which extends anteriorly into the peri-areolar area (BI RADS 4) (Figures 3a-d).

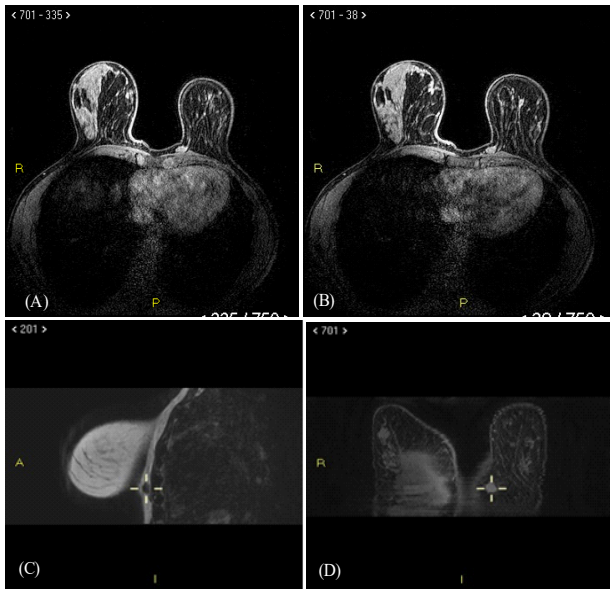


Figure 3a-d: Breast MRI, made without and with contrast medium e.v., had shown, in the left side, in the IIQ left side, in deep seat, a mass-like of 13 X 7 mms about, with uneven enhancement, with vascular pole on the lateral side and not definitely dissociable from the chest wall (BI RADS 5).

A CT scan of all body also showed no distant metastasis.

After multidisciplinary consultation, between breast-surgeon and oncologist and radiologist, because of the presence of the suspected microcalcifications BI-RADS 4 at mammography but not in MRI with c.m. and the typical BIRADS 5 nodule in the IIQ and the other BI-RADS 4 nodule to the superior internal quadrant of the same left side, a conservative approach was decided as oncoplastic surgery with a flap of rotation of second level and an accurate histopathology exam for the risk of local relapse in case of not close-margins was requested.

The surgical tactic (Figures 4a-b) was chosen after a detailed study and reconstruction-phases of the MRI reporting that allowed to carry out the pre-operative drawing and the safe choice of a conservative surgical procedure [7]. The removal of internal- inferior quadrant was made and also a separate excision for the other nodule without removing excess tissue. The malignant nodule was located in the IIQ near the parasternal position and infiltrating superficially the muscle tissue below, in the same context of a large cluster microcalcifications that were benign at the final histopathology exam.

The reconstruction was made with oncoplastic flap obtained through mobilization of the gland at the inframammary sulcus and at the intermammary sulcus. A total axillary lymphadenectomy was made. Two drainages were placed respectively in the breast bed and in the axillary region.

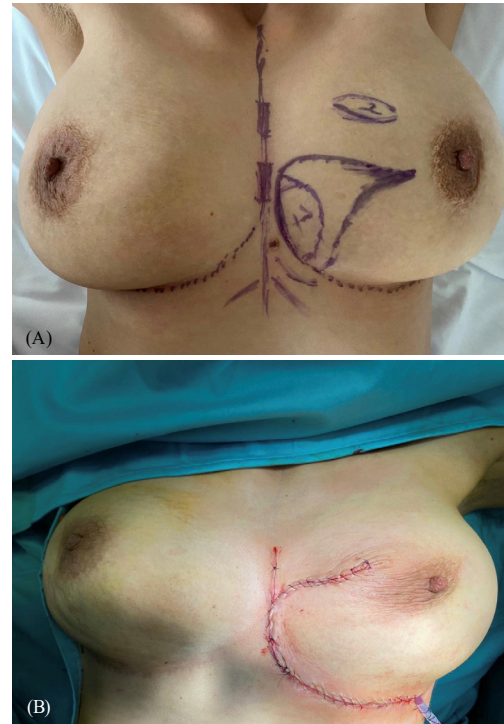


Figure 4: (A) The patient is preparing for surgery. (B) The post-operative result.

The post-operative results were good, the drainage on the breast was removed after 5 days and the one on the axillary region after 21 days, without seroma or others later complications. A good scarring was encouraged by application of a special cream for scar and by monitoring every week the patients.

The resection surgery of breast parenchyma of the lower-internal quadrant of the left breast, fixed in formalin, was submitted to Anatomical Pathology Laboratory [8,10] and subjected to macroscopic exam. It was about the size of 5, 5 X 5 X 4 cm with lozenge of the skin of 5 X 4 cm. Also the benign nodule at the superior internal quadrant was examined.

When cut the main quadrant, a firm neoplasm of whitish colour, hard consistency and of maximum diameter 1,3 cm was found. It was 1 cm from the skin, 1,2 cm from inferior margin (marked with single long wire), 0,5 cm from parasternal margin (marked with double short wire) and 0,2 cm from deep margin (marked with ink). The skin was normconformed. The surrounding parenchyma looked adipose.

The formalin-fixed paraffin-embedded tissue material was cut in 3–4 μ m thick sections and deparaffinised. The sections were stained with hematoxylin-eosin. The material under examination consisted of a stellate invasive carcinoma into abundant fibrotic stroma with a solid, nonglandular architecture (tubule formation < 10%, score 3), high grade pleomorphic nuclei with prominent nucleoli (score 3) and mitotic count of five per 10 hpf 40x (score 1): It was a moderately differentiated invasive duct carcinoma, histologic grade 2, score 7, based on criteria established by Elston and Ellis (Figures 5a-b).

Benign microcalcifications was found in the surrounding parenchyma, but not into the tumor. They were typically benign vascular calcifications, corresponding to calcium deposits in the walls of the mammary arteries. The primary composition of breast calcifications is hydroxyapatite, which will appear dark blue on hematoxylin and eosin stains (Figure 5c).

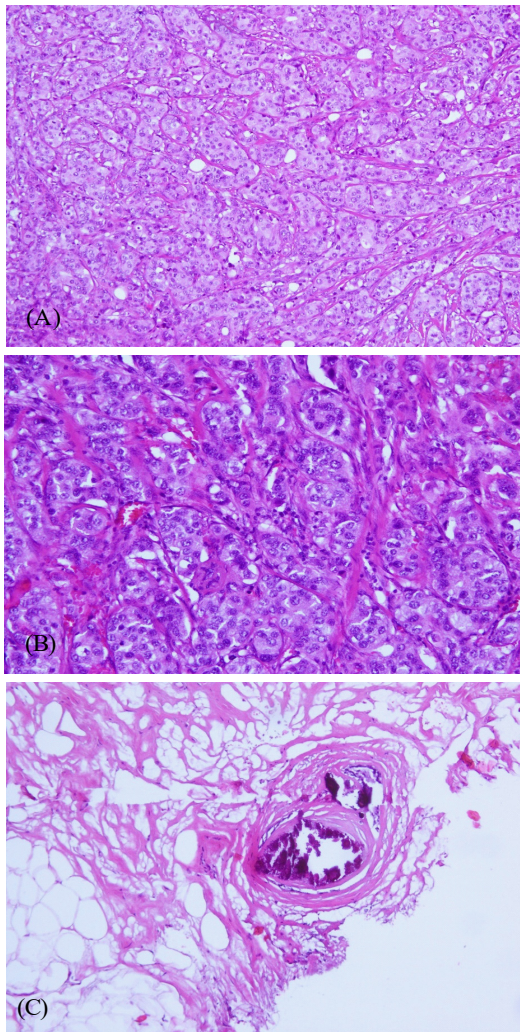


Figure 5: (A) Invasive duct carcinoma: Low magnification showing an invasive duct carcinoma with a solid, nonglandular architecture (HE, 10x). (B) Invasive duct carcinoma: Medium magnification showing high grade pleomorphic nuclei with prominent nucleoli (HE, 20x). (C) Microcalcifications in the surrounding parenchyma (HE, 20x).

At least, she started a chemotherapy scheme with Adriamycin and Cyclophosphamide every 21 days for 4 cycles and then Taxol every week for 12 cycles with Herceptin every 3 weeks all the first year of oncological treatment; after pharmacological therapy, she might start an oncological follow-up, with the promise of a future contralateral surgical symmetrization procedure after this first treatment.

Discussion

Micro-calcifications are a common finding in mammography for breast screening and they usually require invasive procedures to diagnose or exclude malignancy, as stereotactic biopsy; but many microcalcifications are due to benign lesions and the correct indication for breast MRI might be an additional diagnostic tool used to distinguish benign from malignant mammographic microcalcifications in this setting of a complex breast carcinoma [11].

Sensitivity, specificity, positive and negative Predictive Values (PV) for breast MRI are almost higher to mammography or ultrasound exam.

MRI is useful in the Neoadjuvant Chemotherapy (NAC) treatment to allow Breast-Conserving Therapy (BCT) in patients who required mastectomy at presentation.

Breast MRI is more accurate than mammography in assessing treatment response and these patients have less risk of Local-Regional Recurrence (LRR) undergoing breast-conserving surgery if preoperative MRI features including Breast Imaging Reporting and other profiles such as clinical-pathologic features (age, stage, tumor subtype, histologic grade, lymphovascular invasion and Hormonal receptor status) [12,13].

MRI can be useful in the surgical decision and to allow an oncoplastic conservative procedure instead of a conservative mastectomy or a demolytic breast procedure. The Local Regional Recurrence (LRR) is more frequently observed in the same quadrant as the original tumor in the down-staged BCT group than in the preplanned BCT patients as in this case.

Breast MRI has the potential to improve the diagnosis of category-microcalcifications and could alter indications for biopsy. In fact, MRI can reliably exclude malignancy in suspicious microcalcifications. Microcalcifications can be detected by MRI in human whole breast specimens by the application of phase derivative imaging. Breast density and reasons for referral had no significant influence on the diagnostic performance of breast MRI [14,15].

The use of the breast MRI was optimal in our case for the microcalcifications' localization and their definition, especially because we did not have available the R.O.L.L. technique, that is usually a simple, safe and well-tolerated method by patients. In our case, R.O.L.L. was not indicated because of the not clearly malignant nature of microcalcifications [16], as MRI showed.

If we would like to compare the efficacy of a possible radio-guided localization (R.O.L.L.) versus a pre-operative MRI localization in terms of clear margins, re-intervention rates, excess of resected breast tissue, and operative times, we could define that they are equally effective to excise microcalcifications with clear margins, providing similar re-intervention rates and resection volumes, especially in cases where MRI images of microcalcifications don't seem clearly malignant [17].

Conclusions

Technical developments have improved the quality of breast MRI, allowing the acquisition of isotropic high-resolution images. In addition, multiparametric breast MRI has largely replaced the conventional approach, which was primarily based on conventional contrast-enhanced sequences alone for lesion classification.

Indications for breast MRI are now consolidating. MRI allows for improvement of surgical practice, reducing re-excisions while preventing unnecessary mastectomies. From an economic perspective, and to improve patient comfort, breast MRI can be optimized by adjusting the protocol with regard to the indication.

For indications where the exclusion of disease is most important, abbreviated protocols may be used. On the other hand, when lesions need to be characterized in detail, or when the frequency of findings is high, multiparametric protocols are mandatory.

MRI is a good detection method not only for a mass-lesion, but also for defining an architectural distortion, asymmetries and microcalcifications described in mammography.

MRI protocol for breast cancer offers improved time and workflow efficiencies and has the potential to increase the

number of breast cancers detected, as occult carcinoma or multifocal cancer and it is a safe method to define surgical procedures for suspected microcalcifications and the detection of pathologically relevant invasive breast cancer at earlier stages.

MRI is superior to mammography not only in revealing the location, the shape, the border, internal structure of the mass and its chest-wall invasion, but also in revealing the axillary lymph nodes and the internal mammary lymph nodes and the mammary pluggers; MRI is an adequate method to determine the mass nature in displaying microcalcification as BIRADS-3 or BIRADS-4 micracalcifications.

The various actors involved in Breast Cancer management, as in our case that was discussed in a multidisciplinary evaluation, proposed an up-to-date diagnostic and interventional strategy, based on the predictive values and the BI-RADS classification of breast MRI in pre-operative setting for the microcalcifications that are usually highlighted in the first level exams or mammography as a safe and appropriate approach in outcomes and results for breast carcinoma.

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