

## Case Series

# Unveiling unusual radiological findings: Breast volume reduction in patients with pregnancy associated breast cancer: A case series of three patients

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## ABSTRACT

Diagnosis of Pregnancy-associated breast cancer (PABC) is challenging and often misdiagnosed as benign breast disease due to physiological changes during pregnancy or lactation. A delay in diagnosis and management stems from concerns for the fetus and newborn, especially in our social context. PABC patients typically present with breast lumps and enlargement on examination, and masses on imaging. Reduction of breast glandular tissue volume is rare in breast cancer, and few case reports of breast cancer with breast shrinkage are reported in the literature, which were not pregnancy-associated. We are presenting a series of three cases of PABC where we observed ipsilateral breast shrinkage with reduction of fibroglandular tissue as unusual radiological findings in these patients.

**Keywords:** Breast volume reduction, Breast shrinkage, Milk rejection, Pregnancy-associated breast cancer

## INTRODUCTION

Breast cancer is one of the most often diagnosed cancers and the 5th leading cause of cancer-related deaths, with an estimated number of 2.3 million new cases worldwide.<sup>[1]</sup> Pregnancy-associated breast cancer (PABC) is defined as breast cancer diagnosed during pregnancy, in the first year postpartum, or during breastfeeding.<sup>[2]</sup> PABC accounts for less than 3%-5% of all breast cancers. However, it represents up to 20% of cases in women up to 30 years of age.<sup>[3]</sup> The incidence of PABC is 15-35 per 100,000 deliveries.<sup>[4]</sup> Incidence is lower during pregnancy, with two-thirds of all cases being detected in the first six months postpartum. Patients with family history and breast cancer gene, BRCA1, BRCA2 mutations are at a higher risk of PABC; however, most patients do not have a family history of breast cancer.<sup>[5]</sup>

PABC diagnosis is challenging, and it is often misdiagnosed

as benign breast disease due to physiological changes during pregnancy or lactation. As breasts continue to grow and feel firm and nodular during pregnancy, a breast lump may be misperceived as normal tissue during this period. Furthermore, as breasts increase in size, mass may sink deeper, making it more difficult to identify via palpation.<sup>[5]</sup>

Reduction of breast glandular tissue volume is rare in breast cancer, and few case reports of breast cancer with breast shrinkage in non-pregnant women have been reported in the literature.<sup>[6]</sup> Milk rejection<sup>[7]</sup> or breast volume reduction may represent a potential marker in the diagnosis of PABC. We are presenting a series of three cases of PABC where we observed ipsilateral breast shrinkage with reduction of fibroglandular tissue as unusual radiological findings in these patients.

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## CASE SERIES

In this series, we consider ipsilateral breast shrinkage and breast volume reduction as an unusual and important radiological finding. We aim to highlight and describe imaging features that suggest the possibility of pregnancy-associated breast cancer in patients experiencing physiological changes in their breasts.

### Case 1

A 34-year-old lactating lady, post-partum (8 months), presented with a lump in her left breast for 8 months, which was insidious in onset and gradually progressive in nature. There was associated mild on and off pain and redness for the past two months without fever or discharge from the nipple. There was no significant family history.

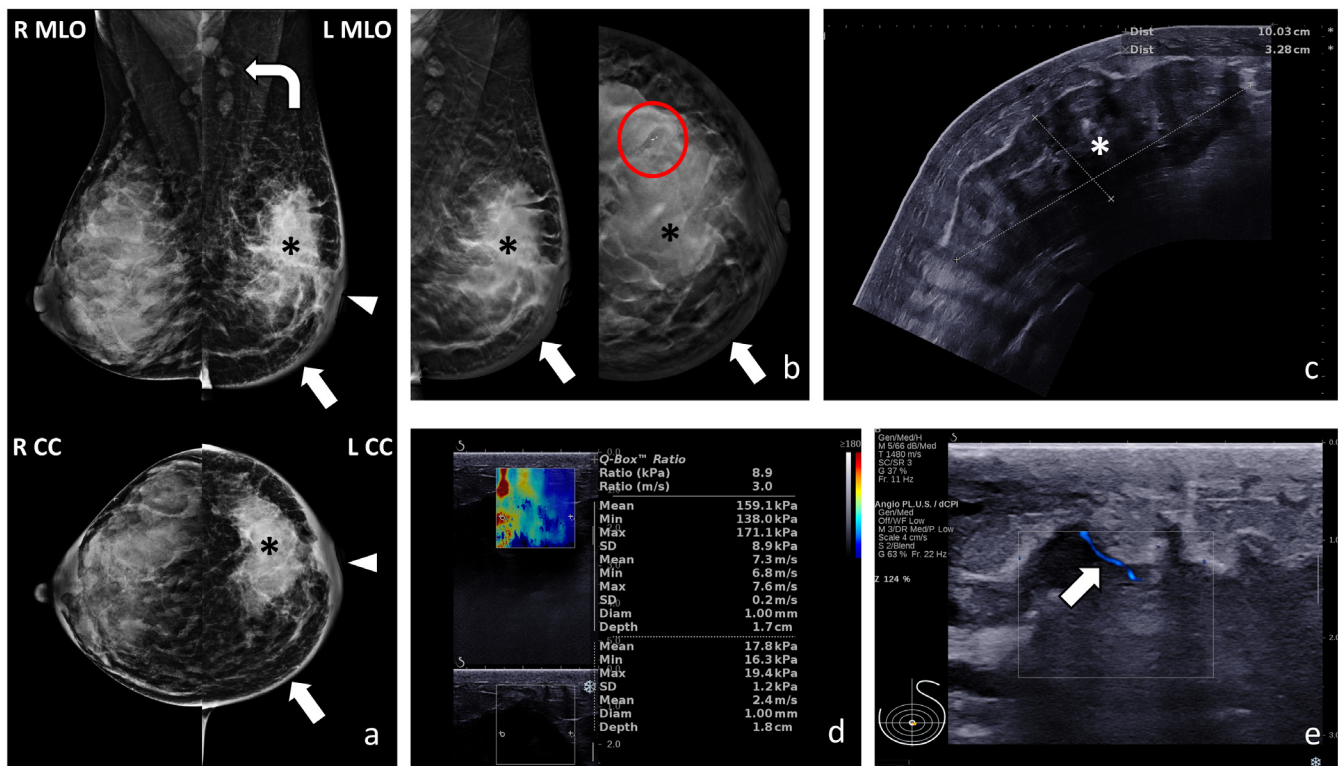
On clinical examination, a palpable irregular lump of 8×6 cm was observed in the left breast involving the upper and lower outer quadrants. The lump was firm in consistency and not fixed to the skin or underlying muscle. Nipple retraction,

Peau d'orange appearance, and hyperpigmentation of the breast skin were seen. The contralateral breast was normal without axillary lymph nodes. Mammography with Digital Breast Tomosynthesis (DBT), Ultrasonography (USG) revealed an irregular mass in the upper outer quadrant of the left breast [Figure 1]. The lesion was staged as T3N0M0 according to the American Joint Committee on Cancer TNM staging system. Histopathology revealed invasive ductal carcinoma (Grade III), Estrogen receptor +, Progesterone receptor +, human epidermal growth factor receptor 2 protein, (Fluorescence In Situ Hybridization not amplified), and Ki-67 index 30–40%.

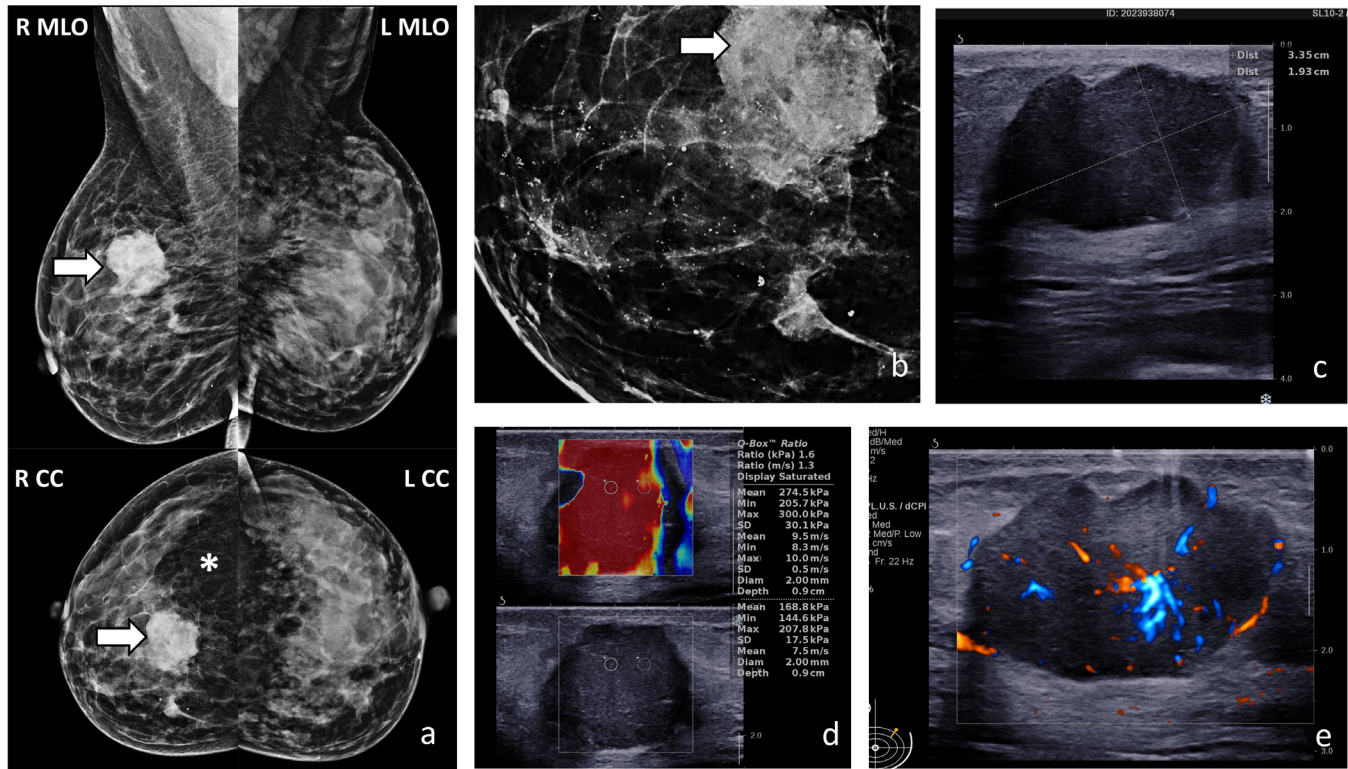
### Case 2

A 28-year-old lactating lady presented with a lump in her right breast for 4 months, insidious in onset and gradually progressive in size. There was no history of nipple discharge, pain, or trauma to the breast. There was no significant family history.

On clinical examination, there was a palpable hard lump of 3×4 cm in the right breast in the inner upper quadrant. The



**Figure 1:** 34-year-old lactating woman, 8 months postpartum, with a left breast palpable mass. Histopathological examination revealed Invasive Carcinoma of no special type (ductal) – Grade III. a) B/L MLO and CC mammogram: An irregular, hyperdense mass with indistinct margins (\*) noted in the upper outer quadrant of the left breast and glandular tissue volume reduction as compared to the contralateral side. Associated left axillary lymphadenopathy (curved arrow), skin thickening (arrow), and nipple retraction (arrowhead). b) Left MLO and CC DBT images: An irregular hyperdense mass (\*) with calcification (circled in red) and skin thickening (arrow). c) USG image: An irregular hypochoic lesion with indistinct margins at 12 to 3 o'clock position in the upper outer quadrant (\*). d) SWE image: Heterogeneous color map in mass and surrounding tissue. The stiffest site (represented by red) is inside the tumor with a mean elasticity of 159 kPa. e) Color Doppler image: Penetrating vascularity (arrow). R CC: Right craniocaudal view, L CC: Left craniocaudal view, B/L MLO: Bilateral mediolateral view, R MLO: Right mediolateral view, L MLO: Left mediolateral view, SWE : Shear wave elastography, USG: Ultrasound, DBT: Digital breast tomosynthesis.



**Figure 2:** A 28-year-old lactating woman with right breast mucinous carcinoma. a) B/L MLO and CC mammogram: An irregular, hyperdense mass (arrow) in the upper inner quadrant of the right breast and glandular tissue volume reduction (\*) as compared to the contralateral side. b) Right CC image (magnified and modified windowing): An irregular, hyperdense mass with microlobulated margins (arrow) and adjacent fine pleomorphic calcification arrow in the upper inner quadrant. c) USG image: An irregular, hypochoic lesion with indistinct margins at 1 to 2 o'clock position in the upper inner quadrant of the right breast. d) Shear wave elastography image: Mass shows heterogeneous colour with the stiffest site in red and inside the tumour. The mean elasticity value is 274 kPa. e) Colour doppler image: Penetrating, peripheral, marginal and radial internal vascularity. R CC: Right craniocaudal view, L CC: Left craniocaudal view, B/L MLO: Bilateral mediolateral view, R MLO: Right mediolateral view, L MLO: Left mediolateral view, SWE : Shear wave elastography

lump was nodular; however, it did not adhere to the skin or the underlying chest wall. No abnormality was detected on examining the contralateral breast and bilateral axilla.

Mammography with DBT, USG revealed an irregular mass in the right breast in the middle one-third of the upper inner quadrant [Figure 2]. The lesion was staged as T3N1M0 according to the AJCC TNM staging system. Histopathology revealed mucinous carcinoma (Grade III), ER+/PR-, HER2/neu 3+ (FISH not amplified), and Ki-67 index 80 %.

### Case 3

A 35-year-old lactating woman presented with a right breast lump for ten months, which was painless, insidious in onset, and gradually progressive.

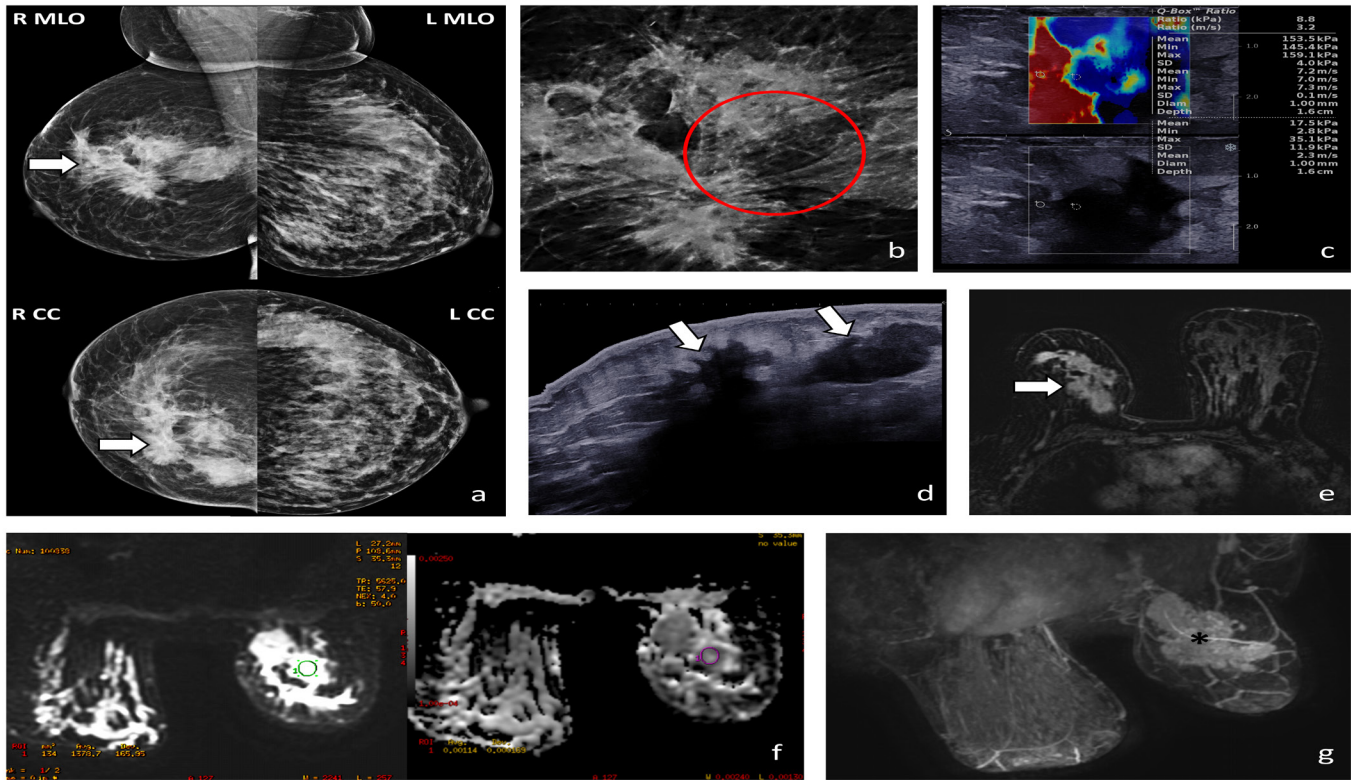
Mammography, USG, and MRI revealed multifocal, irregular, spiculated masses (at least three in number) in the upper inner quadrant of the right breast [Figure 3]. Based on clinical and imaging findings, the lesion was T2N1M0

### Treatment

All three patients received preoperative neoadjuvant chemotherapy followed by modified radical mastectomy and radiation therapy. Additionally, all patients also received hormonal and targeted therapy. Follow-up was recommended for all patients.

### DISCUSSION

The incidence of pregnancy-associated breast cancer is lower during pregnancy and is more common in the postpartum period.<sup>[5]</sup> Ductal infiltrating adenocarcinoma is the most common histological type.<sup>[6]</sup> In our case series, all patients were postpartum females. Two patients had ductal infiltrating adenocarcinoma, one had mucinous carcinoma, and all were positive for hormonal receptors. The reduction in glandular tissue volume of the affected breast was noticed in imaging of all patients of our case series, when compared with the contralateral healthy breast. There is hardly any previous literature mentioning this specific finding in cases



**Figure 3:** A 35-year-old lactating woman with multifocal right breast carcinoma. Histopathological examination revealed invasive ductal carcinoma Grade II. a) B/L mammogram: Multiple irregular, confluent masses with spiculated margin (arrow) in the upper half of the right breast, with glandular tissue volume reduction in the affected breast and no mass lesion in the left breast b) Right Mediolateral mammogram view (magnified): Fine pleomorphic calcification (circled in red) involving the upper half of the right breast c) Shear wave elastography image: The peritumoral site is the stiffest, with a mean elasticity of 153 kPa d) USG: Large confluent ill-defined hypoechoic lesions (arrows) with indistinct margin at 2-3 o'clock position of upper inner quadrant e) Dynamic contrast-enhanced MRI (DCE-MRI): Irregular confluent masses in the upper half of the right breast (arrow) with glandular tissue volume reduction in the affected breast and no mass lesion in the left breast. f) DWI (right) and ADC Map (left): Lesions are bright on DWI with true restriction on ADC map. Green circle is showing area of interest within mass on diffusion weighted imaging and pink circle is showing area of interest within mass on ADC map. g) MIP image of DCE MRI: Irregular, heterogeneously enhancing confluent mass lesions within the upper half of the right breast with glandular tissue volume reduction “\*” is showing masses. R MLO: Right mediolateral oblique view, L MLO: Left mediolateral oblique view, B/L MLO: Bilateral mediolateral oblique view, MLO: Mediolateral oblique view, CC: Craniocaudal view, SWE: Shear wave elastography, USG : Ultrasound, DCE-MRI: Dynamic contrast enhanced magnetic resonance imaging, DWI: Diffusion weighted imaging, ADC: Apparent diffusion coefficient, MIP: Maximum intensity projection

of pregnancy-associated breast cancer. This finding may be explained by the fact that breast cancer causes tumor-induced angiogenesis, leading to an increase in its blood supply.<sup>[8]</sup> In theory, this may lead to reduced blood supply to adjacent healthy glandular tissue, leading to its reduced proliferation and volume reduction in fibroglandular tissue. This might cause reduced milk production in the post-partum period, leading to a reduced tendency to nurse from the affected breast, termed as “milk-rejection sign”.<sup>[7]</sup>

Ipsilateral breast volume reduction may represent a subtle but important radiological clue in suspected cases of PABC. Further studies are warranted to investigate the prevalence and diagnostic significance of breast volume asymmetry and fibroglandular tissue reduction in this clinical context.

We present this observation solely as a possible radiological association, with the intent to raise awareness for further study and validation in larger cohorts.”

## CONCLUSION

Pregnancy-associated breast cancers should be suspected and evaluated promptly. Symptoms may not be dismissed as mere physiological changes or benign pathology. In cases of pregnancy-associated breast cancer, glandular tissue volume reduction in the affected breast on imaging may be an under-recognized but potentially valuable diagnostic imaging feature. This asymmetry, especially in postpartum women, may reflect underlying pathophysiological changes related to tumor biology, such as angiogenesis and altered glandular

function. Recognizing this distinctive imaging feature could facilitate diagnosis and contribute to more accurate characterization of PABC.

**Author contributions:** Asmita: Study conception and design, acquisition, analysis, interpretation of data for the work, critical revision of the manuscript, involved in the diagnosis of the cases, preparation and review of the manuscript; GC: Involved in the management of cases and critical review of the manuscript; AD: Involved in the preparation of the manuscript and diagnosis of cases.

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