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Case Report

Myositis ossificans of the breast - A rare case report with radiologic-pathologic correlation☆☆

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ABSTRACT

Myositis ossificans is a pathologic process of ossification in soft tissues. The breast is an exceptionally rare location for myositis ossificans with less than 5 cases documented in the English literature. We present a case of a 66-year-old woman with myositis ossificans of the left breast and no known initiating trauma. The significance of the progression of clinical and radiological findings are discussed in detail. This case shows the importance of radiology for identifying unique pathology as well as close radiological follow up.

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Introduction

Myositis Ossificans (MO) is a benign tumor-like lesion of soft tissue characterized by abnormal heterotopic ossification. MO typically develops as a solitary, self-limiting lesion in the skeletal muscle, tendons, or fascia following an injury or inflammatory event, and most commonly occurs in places of increased stress, such as the elbow, thigh, buttocks, and shoulder. Histologically, the lesion appears hypercellular and fibromyxoid with numerous proliferating fibroblasts and osteoblasts [1]. In very rare cases MO can develop in the breast

and may present clinically identical to breast malignancies. To date, only a few cases of MO of the breast have ever been recorded [2–5]. We report such a case where MO presented as an enlarging palpable mass, requiring a workup including core needle biopsy, surgical excision, and immunohistochemistry.

Case description

A 66-year-old female presented to the clinic with a painless left breast mass in the upper outer quadrant. She has never

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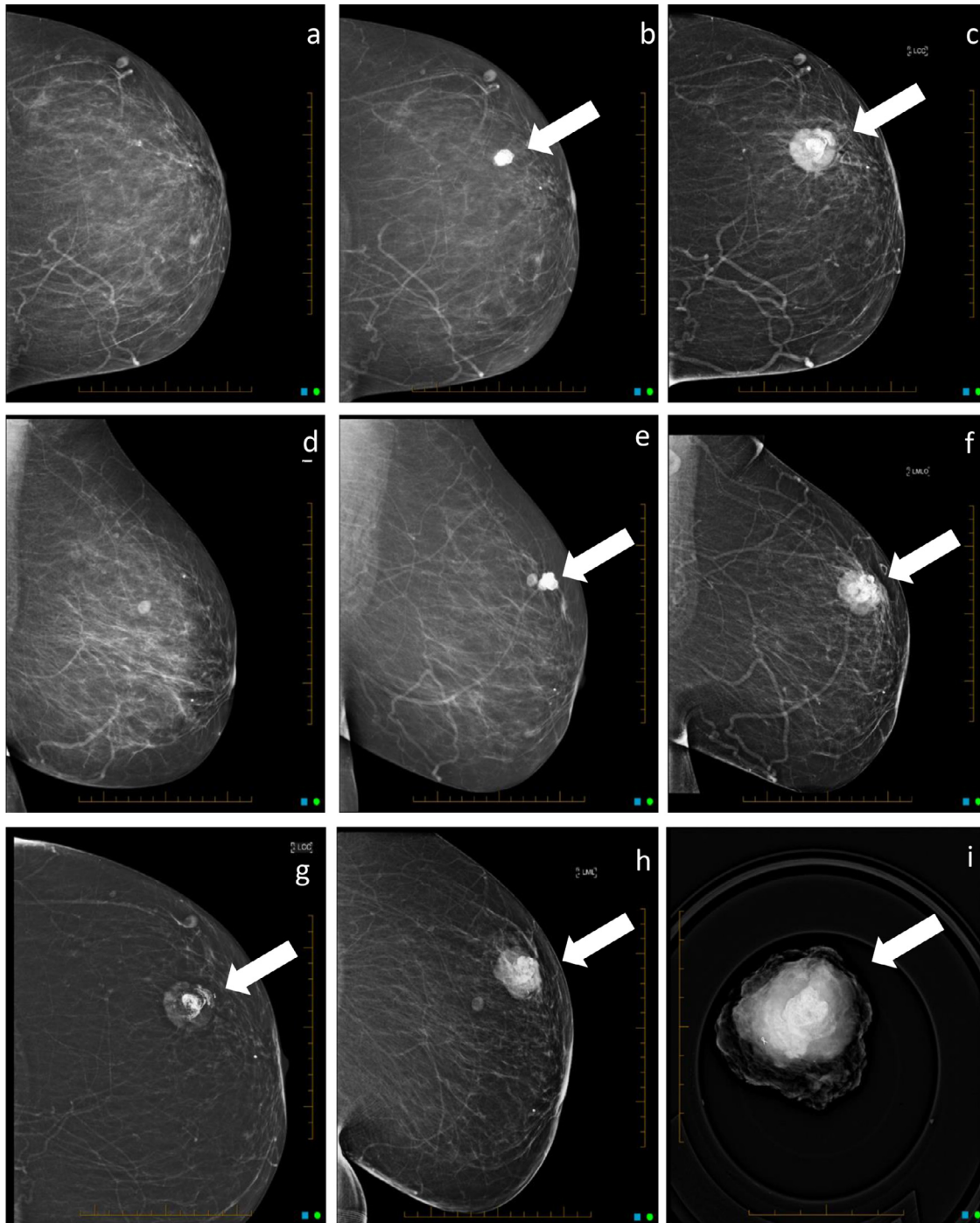


Fig. 1 – Mammography results throughout workup and treatment. A, B, C. CC Views (A) At routine screen 4 years prior to patient presentation, (B) on initial presentation, and (C) on second presentation, 7 months afterward. D, E, F. MLO Views (D) At routine screen 4 years prior to patient presentation, (E) on initial presentation, and (F) on second presentation, 7 months afterward. G, H. CC and MLO Views following core biopsy. (I) Excisional biopsy specimen.

smoked, but she has a history of adenocarcinoma lung cancer with partial left lung resection 10-years prior. She also has a maternal aunt and maternal grandmother with a history of breast cancer.

The imaging work-up at time of initial presentation included diagnostic mammography (Fig. 1B, E). This demon-

strated a round dystrophic calcification measuring 1.6 cm, but no suspicious calcification, mass or architectural distortion. Diagnostic breast ultrasound performed at the same time revealed only the dystrophic calcification at the 1 o'clock position, 5 cm from the nipple, with associated marked posterior shadowing (Fig. 2A, B). The mass was given an assessment of

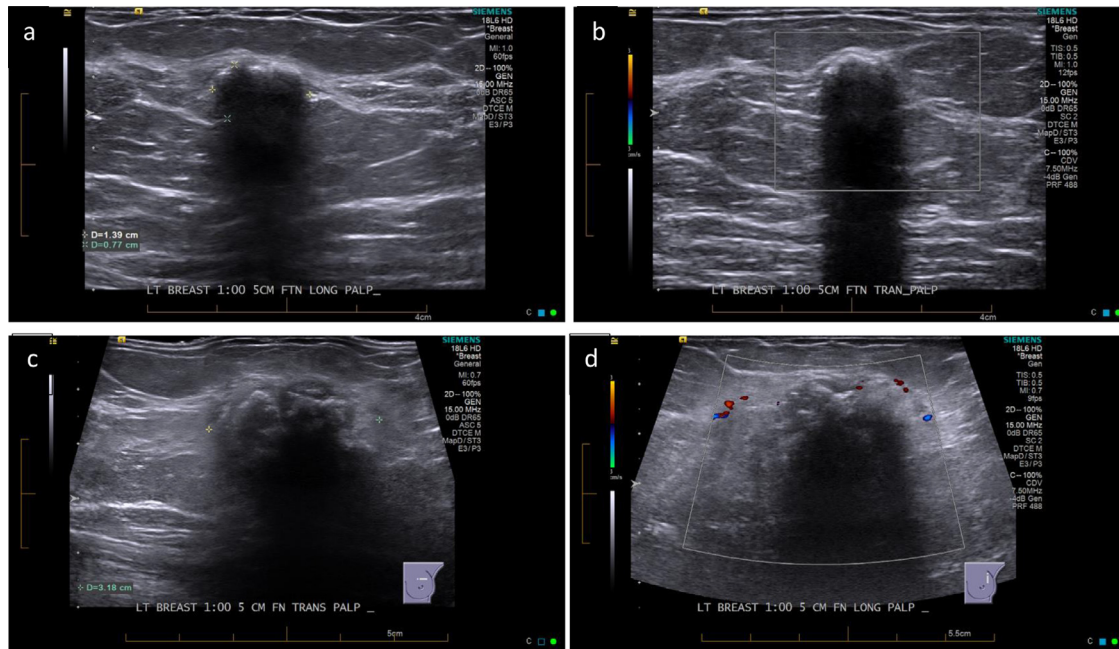


Fig. 2 – Left breast ultrasound results. A. Ultrasound of the left breast on initial presentation showing a 1.4 cm hyperechoic shadowing calcification; B. Doppler-flow performed the same time as A. indicating no angiogenesis; C. Ultrasound of left breast 7-months later showing an enlarged, 3.2 cm mixed echogenicity mass; D. Doppler-flow performed at the same time as C. indicating minimal angiogenesis peripherally.

Breast Imaging Reporting and Data System (BI-RADS)-2 Benign, and follow-up screening mammography in 1 year was advised.

Approximately 7 months later, the patient reported the palpable lesion had become painful and was enlarging. The left breast skin and nipple areolar complex had a normal appearance without retraction. The right breast skin and nipple areolar complex also had a normal appearance and was without masses. There was a 2 × 2 cm mobile mass palpable in the left breast. Diagnostic mammography demonstrated a larger lobulated mass in the upper outer breast measuring 2.4 cm, with a peripheral dense halo of tissue, and central coarse calcification (Fig. 1C, F). Diagnostic ultrasound revealed a mixed echogenicity lobulated mass with indistinct borders measuring 3.6 × 3.2 × 0.8 cm (Fig. 2C, D). Central coarse calcification was again seen, as 7-months before; however, a surrounding rim of hypoechoic soft tissue had developed. A left axilla ultrasound was performed as well, demonstrating no axillary adenopathy. Given the enlargement, and new surrounding soft tissue density, the mass was given an assessment of BI-RADS-4, suspicious for malignancy.

An ultrasound-guided core biopsy was performed (Fig. 3A, B). The biopsy contained a myofibroblastic proliferation with osseous metaplasia, favoring myositis ossificans. Immunohistochemical stains obtained for p63, keratin AE1/AE3 and CK5 were negative in the myofibroblastic proliferation, excluding malignant breast cancer subtypes. Due to the exuberant osteoblastic activity (Fig. 3A-E), follow-up surgical excisional biopsy was performed to rule out under-sampling of malignant phyllodes tumor with heterologous osseous metaplasia. Histological sectioning revealed a well-circumscribed

4.4 × 3.6 × 2.9 cm firm white mass composed of proliferating spindle cells with fascicles of woven and trabecular bone and a small focus of cartilage. There were no signs of hemorrhage, necrosis, excessive atypia, or mitoses. Focal necrosis likely related to the previous biopsy was present. The excisional biopsy was consistent with the initial core biopsy and a diagnosis of myositis ossificans of the breast was confirmed.

Discussion

New-onset breast masses present with a wide differential, so the diagnostic imaging work-up is important to help differentiate benign from malignant lesions. MO can confound the imaging characterization depending on the ratio of non-calcified soft tissue-to-calcified component. MO is a form of soft tissue metaplasia that typically occurs following trauma or infection resulting in heterotopic bone formation. While there are rare cases of idiopathic MO, the overwhelming majority follow a traumatic event such as blunt injury, surgery, infection, or damage to the nervous system [3,6]. Although our patient has a history of partial left lung resection, which may have induced local tissue inflammation, the operative scar is located 5 cm inferolateral to the nipple, making it unlikely to have caused trauma to the upper-outer quadrant of the left breast. Further, MO typically presents within weeks to months of an inciting event, whereas our patient presented 10 years post-operatively [6]. It is extremely rare to occur in the breast, and there few reported cases of this occurrence in the literature [2–5].

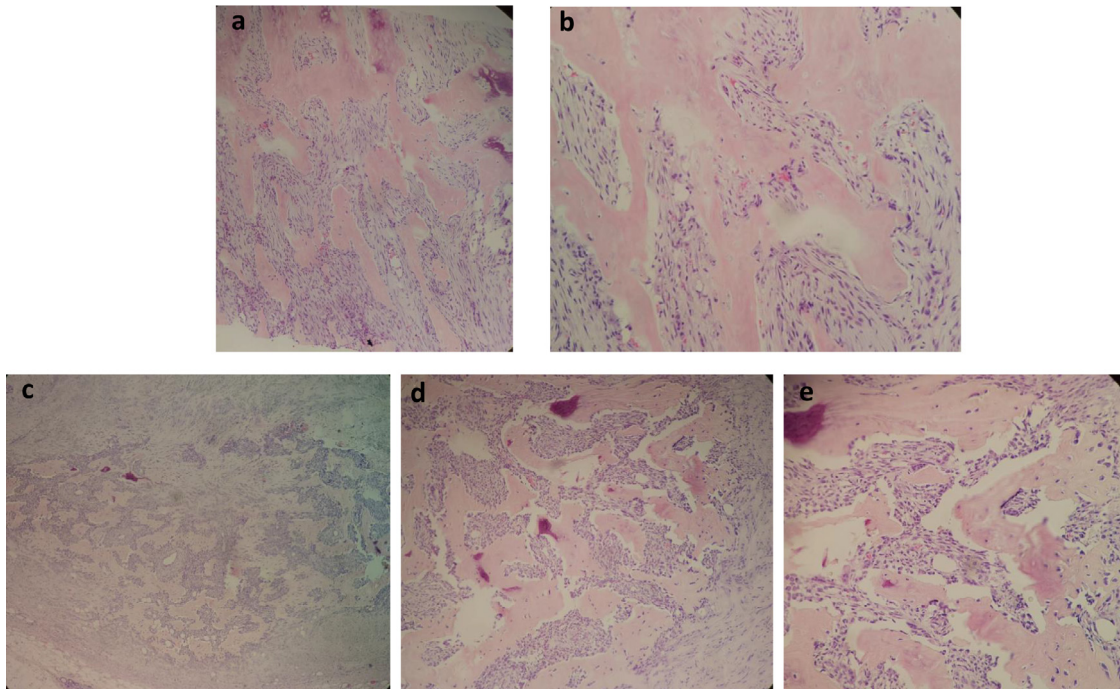


Fig. 3 – Histological evaluation of core and excisional biopsies. A, B. Core biopsies at 100x, 200x; C-E. Excisional biopsies at 40x, 100x, 200x.

Radiographically, MO typically presents as an enlarging, progressively dense calcification at an area of injury. Sonographically, the calcified portion is echogenic with associated shadowing. Vascularization may be evident in the non-calcified hypoechoic soft tissue components in early doppler imaging, but is unlikely to appear in mature, calcified MO [9]. In our case, mammographically, the mass initially presented only as a dense coarse calcification which is typically classified as benign. It was the enlargement and new soft-tissue rim that had developed on follow-up which prompted tissue sampling (Fig. 2).

The pattern of bone formation in MO is identified and diagnosed by its characteristic histology. The myofibroblasts in MO create a three-zone patterning with central fibroblastic proliferation, middle osteoid, and outer woven bone [3]. The three most common variations of MO have been previously described as follows [1]: Type I involves myofibroblastic proliferation with surrounding osteoid islands. Type II consists of immature woven bone and osteoid with occasional surrounding osteoblasts. Type III contains mature lamellar bone and cartilage with surrounding dense fibrous connective tissue. Our findings are most consistent with type II MO, which appears to be the most common subtype of other MO of the breast reports [2–5].

As MO of the breast is exceedingly rare, building a differential diagnosis for a growing breast mass with heterotopic ossification is essential. Phyllodes tumor, fasciitis ossificans, in addition to primary and secondary malignancy are all considerations. Phyllodes tumor with osseous metaplasia is a rare lesion that has a propensity to metastasize to the lungs [7]. It is typically hypervascular and has irregular borders on ultrasound [8]. It requires excisional biopsy to observe the full margins.

Fasciitis ossificans, a nodular fasciitis subtype, should also be considered when working up MO. Both fasciitis ossificans and myositis ossificans are nearly identical in presentation and radiography. Of particular importance is recognizing the location of the lesion in relation to the nearest fascial layer. When the lesion is superficial, fasciitis ossificans may be more likely. An excisional biopsy is required to distinguish the features of the whole lesion. Compared to MO, fasciitis ossificans lacks a middle osteoid zone or bone at the periphery [5,10]. Definitive treatment for both fasciitis ossificans and myositis ossificans is surgical excision.

Malignancy may progress similarly to the presented case, with interval growth and lobulated borders. Taken with the radiologic findings, breast malignancies can be ruled out via immunohistochemical (IHC) studies. The patient's history of lung cancer raises suspicion for metastases. IHC studies revealed negative AE1/AE3, p63, and CK5, ruling out epithelial lineage, myoepithelial lineage, and breast-specific basal epithelial cells, respectively [11]. Another IHC study done was with p63 to rule out bone-forming sarcoma. Excisional biopsy showing spindle cells and woven bone such as in this case can imply bone-forming sarcoma but will also classically have atypia and mitotic figures not seen in our patient's biopsy.

Overall, enlarging breast masses have a large differential, requiring prompt diagnostic workup and accurate classification. MO of the breast is very rare and has thus far only appeared as Type II histopathologically. Non-traumatic MO is even more rare, which can confound the initial workup for partly ossified breast lesions. Although coarse calcifications are classified as benign on mammography, any development of a soft tissue component would warrant tissue sampling.

Patient consent

The case information in this manuscript has been provided with informed consent from the patient presented.

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