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The Imaging of Idiopathic Granulomatous Mastitis: A Narrative Review

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ABSTRACT

Background: Imaging has an established role in the diagnosis and management of idiopathic granulomatous mastitis (IGM). The main purpose of this article is to explain an imaging-based diagnostic approach for IGM and describe the imaging findings of the disease.

Methods: The PubMed database was searched to find the articles published in English from January 2004 to December 2021 using the terms "idiopathic granulomatous mastitis", "imaging", and “radiology.” The search yielded 60 articles initially, of which 17 papers mainly concentrating on the imaging of IGM were assessed.

Results: Ultrasound and mammography are the two commonly used modalities for evaluating IGM patients. Focal asymmetry and irregular high-density mass are the most common mammographic findings. Irregular hypoechoic mass with tubular extensions is a frequent ultrasound finding. Magnetic resonance imaging (MRI) can be used as a complementary modality, but it does not usually change the disease management. The most important differential diagnosis of IGM include breast cancer, infectious mastitis, and tuberculous mastitis. There is currently no agreed-upon schedule for the imaging follow-up of IGM patients.

Conclusion: The commonly used imaging modalities for evaluating IGM include ultrasound with or without mammography. There is currently no consensus for the imaging follow-up of these patients.

INTRODUCTION

Idiopathic granulomatous mastitis (IGM) is a benign inflammatory disease with a chronic or relapsing course.[1-3] The disease often affects young premenopausal women with a history of breast feeding.[1,4] IGM is usually unilateral, but may uncommonly involve both breasts. Bilateral breast involvement has been reported in 0-18 % of cases in different studies.[1-3,5-7]

The diagnosis of IGM is usually challenging as it can mimic some malignant and infectious breast diseases. Diagnosis is confirmed by findings on breast biopsy.[1,8] The most common differential diagnosis of IGM includes breast cancer, infective mastitis, and tuberculous mastitis.[1,9] Breast cancer, especially inflammatory breast cancer (IBC), is an important differential diagnosis of IGM. IBC is a rare and aggressive subtype of breast cancer which mimics mastitis clinically and radiologically. There are two mainstays of IBC diagnosis: (1) clinical findings of

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erythema and edema involving more than one-third of the breast; (2) tissue diagnosis of malignancy.[10] Although dermal lymphatic tumor involvement displayed in skin punch biopsy specimen is the pathologic hallmark of IBC, it is not considered necessary for establishing the diagnosis.[10,11] Tuberculous mastitis is another important differential diagnosis of IGM especially in the Middle East. It is crucial to differentiate the two diseases due to major differences in treatment. Steroids, which are effective medications in the treatment of IGM, are contraindicated in tuberculous mastitis.[12,13]

Imaging has an important role in the diagnosis and management of IGM. Proper diagnosis and management of IGM requires a multidisciplinary approach including clinicians, surgeons, radiologists and pathologists. The main purpose of this narrative review article is to explain an imaging-based diagnostic approach and describe the imaging findings of this disease.

METHODS

We searched the PubMed database and found the articles published in English between January 2004 to December 2021, using the terms "idiopathic granulomatous mastitis", "imaging", and “radiology.” Initially, the search yielded 60 articles, of which 17 papers mainly concentrated on the imaging of IGM.

RESULTS & DISUSSION

Imaging in Diagnosis and Follow-up of IGM

The imaging modalities for the initial evaluation of IGM include ultrasound with or without mammography.[1,7,14] The widely accepted approach is to perform mammography for the patients 40 years of age and older, or for those younger than 40 with findings concerning cancer.[1,15] However, Dursun *et al.* suggested performing unilateral mammography of the affected breast in patients younger than 35 years, and bilateral mammography in patients older than 35 years.[16] Magnetic resonance imaging (MRI) can be used as an adjunct to mammography and ultrasound in the evaluation of IGM; however, it does not usually change the management plan of the disease. A flowchart for the evaluation of patients with clinical findings of non-lactational mastitis is presented in Figure 1.

There is currently no agreed-upon schedule for the imaging follow-up of IGM, which can be explained by various clinical manifestations, different disease courses, and controversial treatment options.[1,12,17,18] Gautier *et al.* suggested performing ultrasound every 3-6 months and mammography annually after the acute phase until complete disease remission is achieved.[7] Some authors suggest MRI for monitoring IGM patients under treatment.[6,7]

According to the authors’ experience, improvement in radiologic findings lags behind the clinical response to treatment which could be explained by different stages of inflammation and fibrosis. In case of clinical response to treatment, the stability of imaging findings should not be interpreted as treatment failure.

Mammography

Mammography can be used in conjunction with ultrasound in the initial imaging assessment of suspected IGM patients, especially in those older than 40 years. IGM has various nonspecific mammographic appearances. The two most common mammographic findings of IGM are focal asymmetry (Figure 2) and irregular high-density mass.[1,7,14,16,19] Other findings include diffusely increased breast density, skin thickening, nipple retraction, and axillary lymphadenopathy. In patients with heterogeneously or extremely dense breasts, there may be no abnormal mammographic finding.[6,16,19] Most IGM cases are not associated with calcifications. However, there have been scarce reports of IGM with calcifications.[1,6,20]

Ultrasound

Ultrasound is the most commonly used imaging modality for the suspected and confirmed IGM cases. Different authors have used a number of different descriptions for the ultrasound findings of IGM. A large irregular hypoechoic mass with tubular extensions (Figure 3) and multiple confluent hypoechoic lesions with tubular extensions are the most commonly described ultrasound findings.[1,2,7,14,21] The presence of multiple tubular hypoechoic lesions insinuating between the breast lobules and extending superficially towards the skin is a characteristic finding of IGM.[1,7] Fluid collections or abscesses may be seen in some patients.[1,6,7,22] The lesions and the surrounding parenchyma are usually hypervascular;[1,6,22] however, the abscess has no internal vascularity. Skin fistulas can develop spontaneously or in the site of previous percutaneous biopsy or aspiration.[1,6,19] Nipple retraction can be seen in some IGM patients; however, inflammation and ulceration of the nipple-areola complex is uncommon.[1,14,23]

Axillary lymphadenopathy is another associated finding which has been reported with different frequencies in different studies.[2,14,22] The lymphadenopathy in IGM appears as hypoechoic cortical thickening with preserved fatty hilum, and may sometimes be mistaken for malignant adenopathy.[1]

IGM shares similar imaging findings with some breast diseases such as IBC and tuberculous mastitis.

Both IGM and IBC can cause breast edema and axillary lymphadenopathy. One clue may be the extent of skin thickening and edema, which is more extensive in IBC than IGM. Another differential diagnosis is tuberculous mastitis which has similar imaging features. A clue can be the history of lung tuberculosis which is present in half of the patients with tuberculous mastitis.[13] Finally, biopsy is mandatory for differentiating IGM from other breast diseases.

Ultrasonography is frequently used as a guide to perform core needle biopsy which is the standard method to confirm diagnosis and rule out other diseases, such as breast cancer and tuberculous mastitis.[1,6-8] Furthermore, ultrasound can be used as a guide to aspirate the abscess. IGM patients are prone to develop skin fistulas along the percutaneous needle tract.[1] According to the authors' experience, it is preferable to introduce the needle through the intact adjacent skin to reduce the patient's pain and risk of fistula formation.

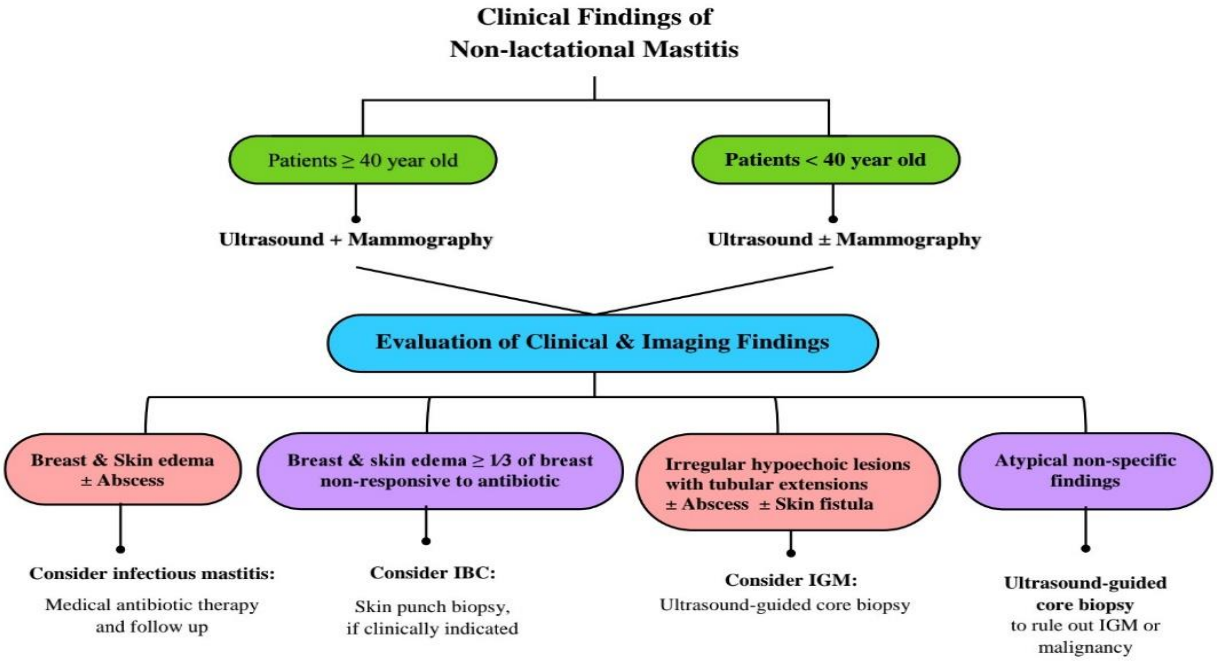

Figure 1. Flowchart for evaluation of patients with clinical findings of non-lactational mastitis.

Magnetic Resonance Imaging

MRI can be used as a complementary modality in the following indications: (1) Determination of the disease extent; (2) Inconclusive sonography and mammography findings; (3) Monitoring response to treatment or evaluating possible residual disease after treatment.[1,7,9,21] It should be emphasized that MRI findings do not usually change the disease management and only a small group of patients may benefit from MRI. Therefore, performing MRI should not cause any delay in the diagnosis or treatment of the disease.[1]

MRI can be used as an adjunct to mammography and ultrasound in the evaluation of IGM. The most common MRI findings are rim enhancing masses (Figure 3), heterogeneous enhancing masses, and heterogeneous non-mass enhancement (NME) with segmental or regional distribution.[1,6,7] Most lesions show high signal intensity on T2-weighted and variable signal intensity on T1-weighted images.[1,7] The lesions usually demonstrate restricted diffusion on diffusion-weighted imaging.[6]

Previous studies have found varied results regarding the enhancement kinetic curves of IGM lesions. Khawari *et al.* found the plateau and washout patterns of kinetic curves in their cases.[22] Gautier *et al.* observed that all lesions enhanced rapidly, with a persistent curve in NME and a washout curve in most of the rim enhancing lesions.[7] Oztekin *et al.* found a persistent kinetic curve as the most common pattern of enhancement.[21-23] These different results could be attributed to varying degrees of inflammation, fibrosis, and abscess. Therefore, the kinetic curves are nonspecific and unreliable for differentiating IGM from breast cancer.[1]

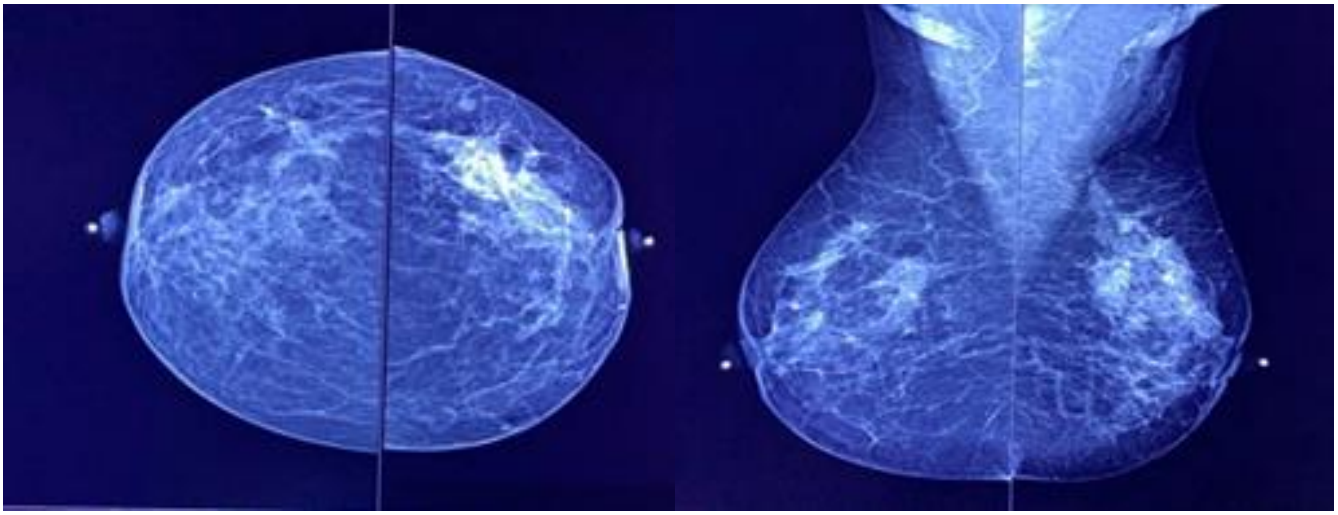

Figure 2. IGM in a 50-year-old patient with a painful mass of 3 weeks' duration in the left breast. Digital mammography showed focal asymmetry in the upper outer region of the left breast. Ultrasound-guided core needle biopsy showed granulomatous mastitis and was negative for acid-fast bacilli and fingers.

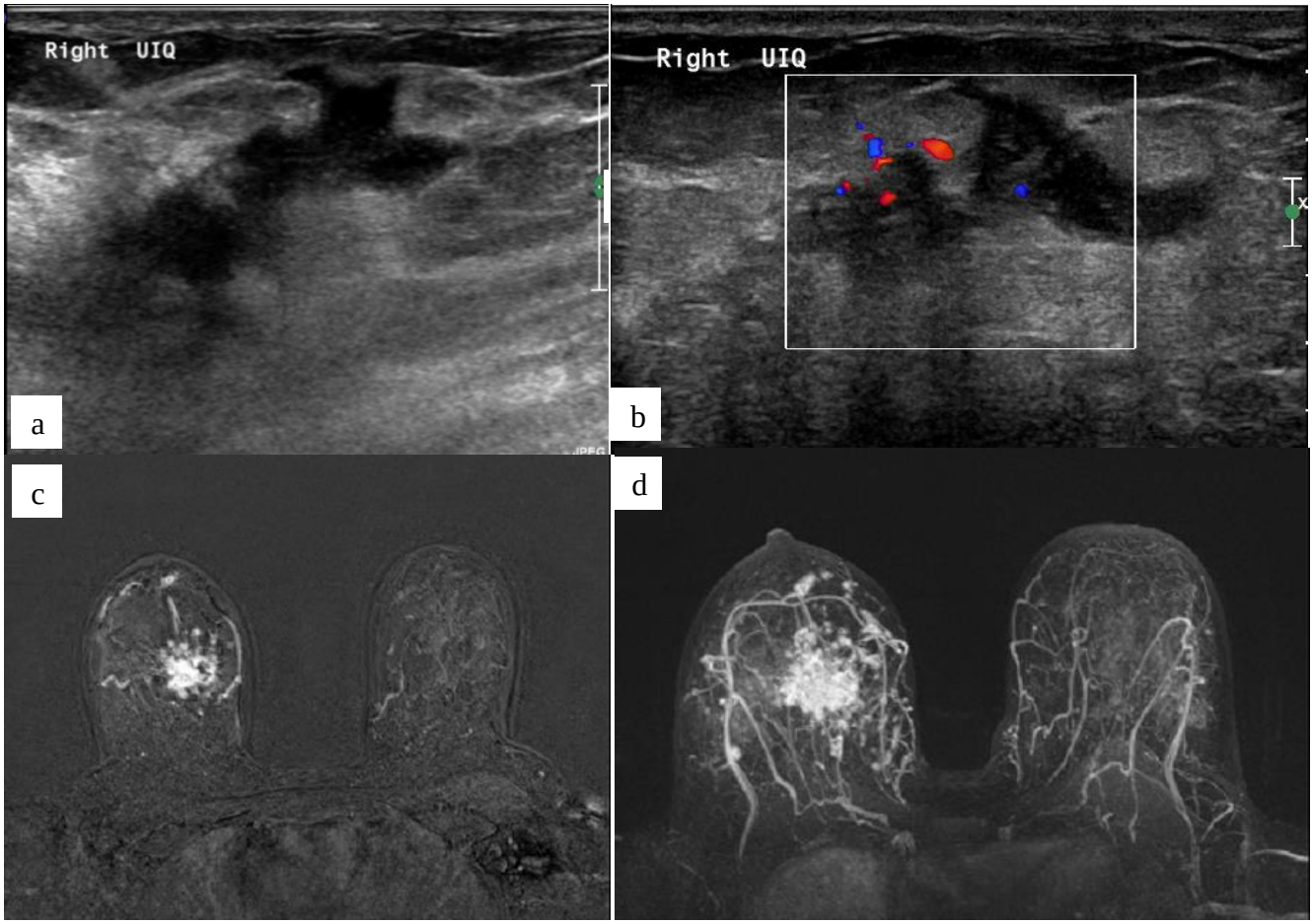

Figure 3. IGM in a 34-year-old patient with a painful mass in the right breast. Ultrasound imaging **(a, b)** shows irregular hypoechoic lesions with tubular extensions. Vascularity is noted within and surrounding the lesions. Axial T1-weighted post-contrast subtraction axial MRI **(c)**, and axial T1 weighted post-contrast maximum intensity projection (MIP) **(d)** display an irregular enhancing right breast mass with an area of rim enhancement consistent with abscess formation. Ultrasound-guided core needle biopsy revealed granulomatous mastitis and was negative for acid-fast bacilli and fungi.

CONCLUSION

Idiopathic granulomatous mastitis (IGM) is a benign inflammatory disease with various nonspecific imaging features. Ultrasound is the most commonly used modality for the initial evaluation of these patients. Irregular hypoechoic mass with tubular extensions is a frequent ultrasound finding. Mammography is usually performed for the patients 40 years of age and older, or for those younger than 40 with findings suspicious of cancer. Focal asymmetry and irregular high density mass are the most common mammographic findings in IGM. MRI can be used as a complementary modality, but is not useful for differentiating IGM from breast cancer. The most common MRI findings are rim or heterogeneous enhancing masses, and heterogeneous segmental or regional NME. Diagnosis is confirmed by core biopsy. There is currently no consensus for the imaging follow-up of IGM patients. According to the authors' experience, improvement in radiologic findings lags behind the clinical response to treatment.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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