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Review

The Role of Imaging Methods in the Diagnosis and Treatment of Idiopathic Granulomatous Mastitis

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ABSTRACT

Idiopathic granulomatous mastitis (IGM) is an uncommon chronic inflammatory disease of the breast with an unclear etiology that mostly impacts young women. Its incidence is higher in the Middle East and Asian countries, particularly in Türkiye. Clinical signs such as mass, fistula formation, swelling, and radiographic abnormalities such as lymph node enlargement, abscess, calcifications, localized or widespread asymmetric density, and hypoechoic lesions may result in a misdiagnosis of malignancy or infection. There are no imaging findings that distinguish between IGM and breast cancer in any imaging method; in most cases, imaging tests like ultrasonography, magnetic resonance imaging, or mammography reveal non-specific characteristics, leading to biopsy. Histological assessment is used to reach a conclusive diagnosis of IGM. Common medical treatments include systemic steroid treatment (oral corticosteroid), local steroid treatment (local steroid injection in breast,), antibiotics, immunosuppressive drugs (methotrexate, etc.), and monoclonal antibodies. Abscess drainage and surgical excision are further alternatives. Although the conclusive diagnosis of IGM is made histologically, imaging methods have a significant impact in evaluating the number, location, their size, abscess development, and the likelihood of intervention, stability or change in lesions, and response to treatment in patients with confirmed diagnosis. In addition, radiology and interventional radiology units guide clinicians in the timely diagnosis of the disease and play an important role in local steroid injection, which is used effectively in its treatment.

Keywords: Idiopathic granulomatous mastitis, ultrasonography, magnetic resonance imaging, mammography, diagnosis, treatment

INTRODUCTION

Idiopathic granulomatous mastitis (IGM), also known as lobular granulomatous mastitis, is an uncommon chronic inflammatory disease of the breast with an unclear etiology. The average age of patients at presentation is between 32 and 35 years, a condition that primarily affects young women.[1-3] The most commonly recognized hypothesis is hypersensitivity, or autoimmune reaction, although the etiology remains unknown.[4] IGM is characterized by chronic non-necrotizing lobulocentric granulomatous inflammation around lobules and ducts, with a prolonged course of recurrent disease. IGM is mostly a disease that affects young women who are of reproductive age, and its frequency is higher in Middle Eastern and Asian countries, particularly Türkiye. This suggests that the disease's origin results from both environmental factors and genetic etiology.[5,6]

The misinterpretation of cancer or infection may result from clinical signs such as swelling, mass, and fistula development, as well as radiographic abnormalities such, lymph node enlargement, abscess, calcifications, isolated or widespread asymmetric density, and hypoechoic lesions.[7] Although IGM is not cancerous, it can be extremely resistant to treatment and locally aggressive, which can have a major negative impact on a patient's quality of life and result in cosmetic issues.[8]

There are no imaging findings that distinguish between IGM and breast cancer in any modality. Imaging tests like ultrasonography, magnetic resonance imaging (MRI), or

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mammography reveal non-specific characteristics, leading to biopsy.[7,9] There are some non-specific features of imaging in mastitis to confirm mastitis, assess the degree of the lesion, and determine the efficacy of conservative treatment. The extent of the lesion and the type of drainage required can be determined using ultrasound (US).[10]

A final diagnosis of IGM is made by histological investigation. Common characteristics of IGM include the presence of neutrophils, lobulocentric granulomatous inflammation, non-caseating granulomas, giant cells, and epithelioid histiocytes.[11]

Imaging of IGM

IGM is often aggressive and has characteristics of infected mastitis or inflammatory breast cancer. IGM diagnosis can be challenging and typically takes time. Before making an IGM diagnosis, cancer and all other probable causes of mastitis must be ruled out.[12] The appearance of imaging varies according to the amount of inflammation, the timing of radiographic evaluation, and the potential for previous intervention.[13] Even though US and mammography are often sufficient for imaging granulomatous mastitis, MR imaging can be useful for assessing advanced, aggressive, or refractory illness.[12]

Mammography

IGM is often a disease of reproductive age; therefore, mammography sensitivity reduces because the breast tissue pattern is dense in women of this age range.[14] IGM's mammography findings are non-specific, with varying imaging features. Examination of the literature suggests that focal asymmetry is the most common finding on mammograms. Especially in the presence of extremely dense or heterogeneous breasts, there are no imaging findings on mammography.[12,15-17] In some studies, studies have stated that global asymmetry or asymmetric dense breast parenchyma, is a less common appearance of granulomatous mastitis.[18,19] Mammographic findings in IGM include thickening of the skin, a solitary mass or multiple masses, nipple and skin recession, and axillary lymphadenopathy.[13,15,19] IGM is not generally associated with calcifications, and this condition is rarely reported.[12] (Figure 1)

MAIN POINTS

- Idiopathic granulomatous mastitis (IGM) is a rare chronic inflammatory disease of the breast, of unclear etiology, which mostly impacts young women.
- Common medical treatments include steroid therapy, antibiotics, immunosuppressive drugs, and monoclonal antibodies. Alternatives include surgical excision and abscess drainage.
- While histopathology is the final diagnostic method for IGM, imaging methods have a significant impact in evaluating the number and location of lesions, size of lesions, abscess development, and the likelihood of intervention, stability or change in lesions, and response to treatment in patients with confirmed diagnosis.

US

Ultrasound is useful for assessing patients whose mammograms are normal but have palpable lesions on physical examination, although ultrasound findings of IGM may vary. The most common manifestation reported is a large mass with irregular borders, hypoechoic, and heterogeneous internal structure, with tubular extensions.[12,15,19,20] Posterior acoustic features can vary greatly, including both shadowing and enhancement.[12,15,17,21] Almost all lesions have a parallel orientation.[22] Doppler imaging shows that lesions and the surrounding breast parenchyma have increased internal blood flow.[13] In advanced disease, fluid collections or abscesses may occur.[12,15] (Figure 2) Other ultrasound findings include axillary adenopathy, subcutaneous fat obliteration, edema and skin thickness.[12,15,19]

A relatively new technique, Shear Wave Elastography (SWE), is a sonography-based imaging method used to assess tissue stiffness, and its usage area is gradually increasing. In patients with IGM, tissue rigidity increases in SWE, which can cause IGM to be confused with malignant lesions. Evaluation with SWE has primarily focused on distinguishing IGM from malignant lesions. SWE has high specificity and sensitivity in differentiating IGM from breast cancer with a lower shear wave velocity value and a lower SWE score. Current publications have revealed that elastography is utilized not only for diagnosis but also to evaluate the success of treatment.[6,23,24] The Tsukuba scoring system is a classification system developed by Itoh et al.[25] that evaluates SWE features. This scoring system states that a score of 1 to 3 indicates benign, whereas a score of 4 to 5 indicates a possible cancer.[25,26] (Figure 2)

MRI

MRI is a useful imaging method in addition to ultrasound and mammography in the evaluation of patients, and the findings in MRI vary depending on the severity of inflammation.[15,19,27] The most frequently identified findings on MRI are heterogeneous enhancing mass (or masses) or ring-shaped enhancing lesions. MRI may also show associated segmental or regional non-mass enhancement (NME). Some small lesions with confluency or well-defined margins, T2 hyperintensity, and rim enhancement at MR imaging have been assumed to be microabscesses (Figure 3). In serious disease, larger fluid collections can be identified interspersed with abnormal enhancement, with or without sinus tracts, that extend to the skin surface. NME without an accompanying mass is also prevalent, and NME with IGM has a more segmental distribution than a regional one. Diffuse NME is rarely encountered. Additional MRI findings include nipple retraction, nipple and/or skin thickening, axillary lymphadenopathy, sinus tracts, and parenchymal distortion. Although most examples include progressive or plateau patterns of enhancement, the enhancement kinetic aspects are non-specific. There is a small number of studies that demonstrate lesion enhancing patterns of plateau or washout.[12,15,19,20,27,28] Due to the variety in enhancement kinetic characteristics, MRI cannot consistently distinguish IGM from inflammatory breast cancer.[29] Importantly, MRI may be useful in following challenging cases treated with conservative therapy, documenting relapse, and assessing disease progression over time.[12]

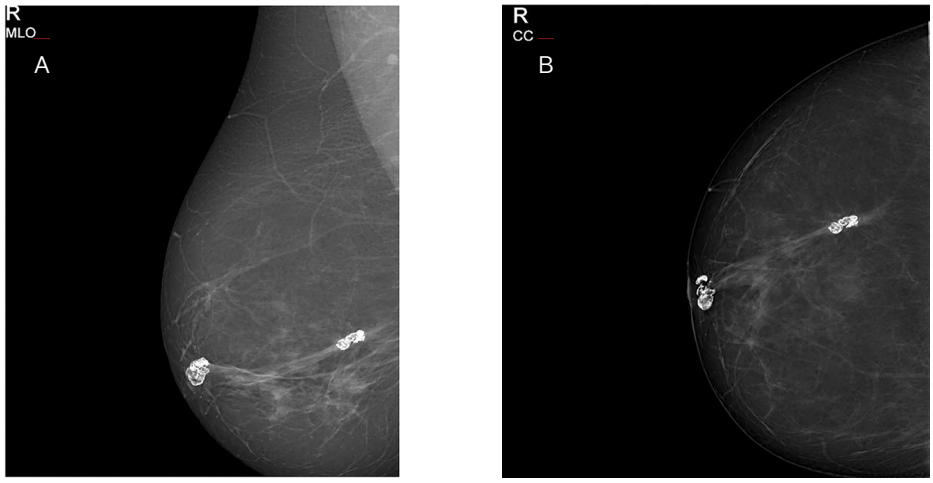

Figure 1. IGM in a 38-year-old woman with a painful mass of 4 weeks' duration in the retroareolar and outer region of the right breast. A and B: MLO (**A**) and CC (**B**) digital mammography images show coarse heterogeneous calcifications in the retroareolar and outer-middle region of the right breast, a rare finding of IGM.

IGM, idiopathic granulomatous mastitis; MLO, mediolateral oblique; CC, craniocaudal.

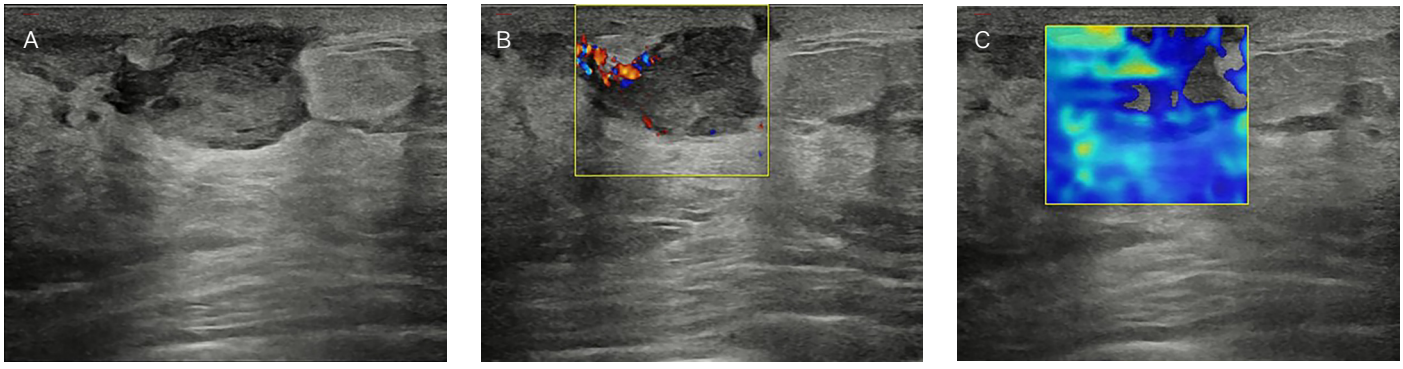

Figure 2. 28-year-old woman who presented with a tender, rapidly growing left-breast mass. Antibiotic treatment trials were unsuccessful. Abscess aspirations yielded sterile cultures and no malignancy. Pathology result was reported as IGM. (**A**) and (**B**) Ultrasound images obtained at the 2-o'clock to 6-o'clock position in the left breast for shows a complex mass with solid and cystic components and internal vascularity. The mass was believed to represent surrounding inflammation and/or granulation tissue associated with abscess formation. (**C**) Elastographic examinations show that the elasticity value of the lesion is in the benign category according to the Tsukuba scoring system.

Treatment of IGM

Once diagnosed, optimal treatments are urgently required to manage IGM.[30] The disease's long natural history and recurrence complicate decisions about how to treat and follow up. There has been a shift toward combination medical therapies, with or without surgery, to manage long-term and recurrent cases.[31] Common medical treatments include steroid therapy, antibiotics, immunosuppressive drugs (methotrexate, etc.), and monoclonal antibodies.[1]

Although antibiotics are also used in the treatment, this is questionable, as a direct causal relationship between bacterial infiltration and IGM has not been determined. The use of antibiotics is decided based on available microbiological data, and the selected agents are directed against gram-positive organisms.[32]

Abscess drainage and surgical excision are among the treatment options.[1] Surgery has unfortunate cosmetic effects, a prolonged scar healing process, and a high relapse rate. As a result, systemic steroids have been the most commonly used treatment for IGM.[33,34]

Systemic steroid therapy is the mainstay treatment for IGM and has been successful in up to 75% of patients.[18] However, long-term use of steroids can cause well-known, potentially serious side effects such as weight gain, impaired glucose tolerance, osteoporosis, peptic ulcers, Cushing's syndrome, and even mental disorders. For this reason, the duration of treatment should be adjusted according to the response of the disease, and the dose of steroids used in treatment should be as low as possible.[9,35,36]

Topical corticosteroids may be used adjunctively to prevent skin breakdown and control skin symptoms. In recent years,

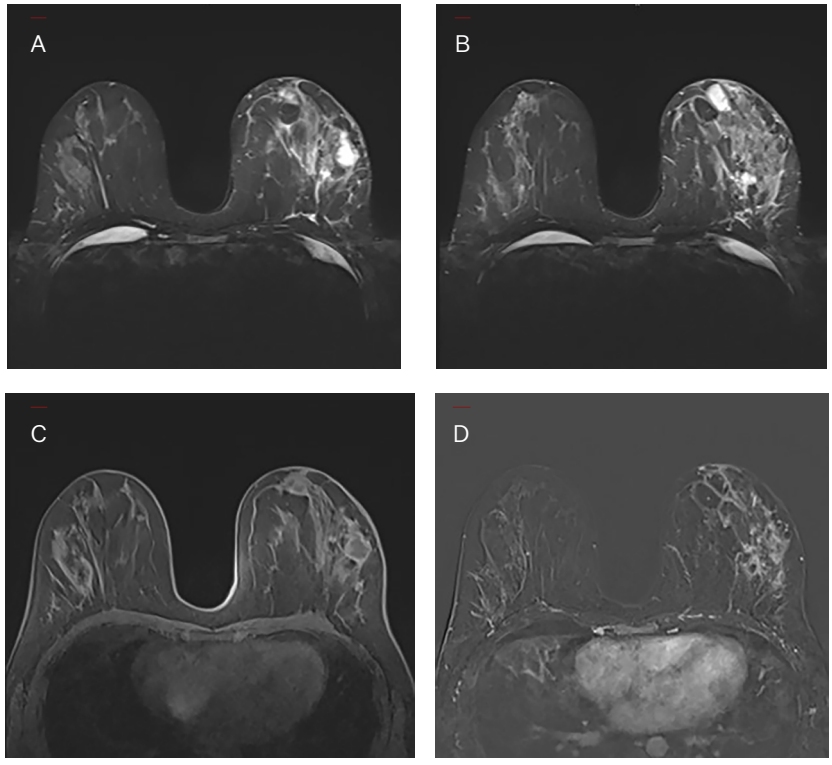

Figure 3. MRI in a 26-year-old female patient who complained of pain and swelling in the left breast and whose pathology result was reported as IGM. (**A**) and (**B**) On axial T2-weighted fat-saturated images, cystic lesions are observed in the retroareolar area and outer middle quadrant of the left breast. (**C**) In the gadolinium-based contrast material-enhanced axial T1-weighted fat-saturated image, there are lesions suggestive of a wall-enhanced abscess in the retroareolar plane and outer middle quadrant of the left breast. (**D**) In the gadolinium-based contrast material-enhanced axial T1-weighted fat-saturated subtraction image, irregular parenchymal contrast enhancements are observed in the outer quadrants of the left breast.

MRI, magnetic resonance imaging; IGM, Idiopathic granulomatous mastitis.

intralesional steroid injection has also emerged as a novel therapeutic approach. Topical corticosteroids, and intralesional corticosteroid injections may be used primarily to treat IGM patients who are experiencing systemic corticosteroid side effects or skin changes. The combination of intralesional and topical steroids may help decrease the likelihood of adverse effects such as atrophy, bruising, and the development of sterile abscesses while also extending the interval between intralesional steroid injections.[6,35,37-39]

Steroids and immunosuppressants have a similar mechanism of action on IGM. The most commonly used immunosuppressive agent is methotrexate. However, its use is limited due to side effects such as pulmonary fibrosis, bone marrow suppression, hepatic and nephrotoxic damage.[35,40]

CONCLUSION

IGM is a rare, benign chronic inflammatory breast disease for which the exact causes and recommended treatment approaches are not well defined. Imaging findings of IGM are not specific. It has features that often overlap with inflammatory breast cancer and other inflammatory breast diseases. Given the non-specific imaging findings of IGM, diagnosis is often based on the presence of specific histopathological findings and exclusion of other causes of inflammatory breast disease. Because of the substantial clinical and radiographic overlap with breast cancer, a histologic diagnosis requires a tissue sample. Corticosteroids, immunomodulatory medications, and antibiotics are among the medicinal therapies available. Surgery is often saved for situations where medical therapy is ineffective and the condition continues to worsen. In patients with histologically confirmed IGM, imaging methods play an important role in evaluating the multiplicity and location of lesions, lesion size, abscess formation and the possibility of intervention, lesion stability or change, and the response to treatment. In addition, radiology and interventional radiology units guide clinicians in the timely diagnosis and play an important role in local steroid injection, which is used effectively in its treatment.

Ethics

Informed Consent: N/A.

Footnotes

Author Contributions

Concept Design – H.A., S.A., M.K.; Data Collection and/or Processing – H.A., S.A.; Analysis and/or Interpretation – H.A., M.K.; Literature Review – H.A., S.A.; Writing, Reviewing and Editing – H.A., S.A., M.K.

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