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Ultrasonographic Findings of Idiopathic Granulomatous Mastitis in a Case Series from a Tertiary Center

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ABSTRACT

Background: Idiopathic granulomatous mastitis (IGM) is one of the uncommon benign relapsing diseases of the breast and the imaging features of IGM can be indistinguishable from invasive or inflammatory breast carcinoma. Therefore, the assessment of the ultrasound features could be diagnostically helpful.

Material and Methods: This retrospective research involved a total of 26 patients who had a final pathologic diagnosis of IGM and who underwent high-resolution ultrasound (US) and color Doppler evaluation.

Results: Overall, 26 patients met the inclusion criteria. The age range of the patients was between 24 and 52 years old with an average of 34.81. About half of the patients (53.8 %) reported pain as a presenting symptom and the most common physical finding was a palpable mass in 53.8% of the cases. Ultrasonography revealed the most common mass shape to be oval and irregular both with a frequency of 47.1%. Mass margins were mostly indistinct (70.6 %) while angular and circumscribed margins were also seen. Heterogeneous echogenicity was observed in 71.4%, increased echogenicity of perilesional fat in 84.6%, posterior acoustic enhancement in 57.7%, peripheral vascularity in 30.8%, and subcutaneous collections in 19% of the patients., Internal vascularity was seen in 7% of the cases.

Conclusion: In the US of IGM, increased echogenicity of subcutaneous and perilesional fat were a common ultrasound feature (84.6%) while perilesional fat edema has not been mentioned in previous studies. In this study, other ultrasound features of IGM such as tubular extension, subcutaneous collection, indeterminate irregular masses, and collections were observed. They may contribute to the diagnosis of granulomatous mastitis in a proper clinical setting.

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INTRODUCTION

First described by Kessler and Wolloch in 1972 as an uncommon relapsing chronic inflammatory disease of the breast, idiopathic granulomatous mastitis (IGM) still has an unknown etiology.¹ It is known to be a benign condition and the proposed

etiologies range from infectious to non-infectious causes. IGM is mostly diagnosed in women of reproductive age and is reported to be more common in some countries in the Middle East, such as Iran, Turkey, and Egypt.²⁻⁵ The importance of IGM lies in its clinical and imaging resemblance to all types of breast cancer, thus causing a tremendous amount of concern for the patients and physicians. Palpable mass and mastalgia are the most common clinical complaints in patients with both IGM and inflammatory breast cancer; thus, non-invasive

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imaging techniques including magnetic resonance imaging and ultrasonography can help discriminate these two clinically differential diagnoses.^{6,7} Patients with IGM are mainly worked up due to a focal asymmetric density seen in mammography and/or an irregular hypoechoic mass with tubular extensions on ultrasound. Following a thorough physical examination and imaging, a core needle biopsy is typically required to come to a definitive diagnosis and rule out other differential diagnoses. Once the diagnosis is established by tissue sampling, corticosteroids and immunosuppressant agents are the lines of treatment.⁸ Treatment is chosen according to the disease severity and the relapsing symptoms.

Medical imaging plays a key role in assessing patients with a palpable mass, giving further details on the characteristics and features of the lesion. Medical imaging can also rule in or rule out specific differential diagnoses. Mammography, ultrasonography, color Doppler sonography, and magnetic resonance imaging (MRI) have been commonly used to assess the presence of IGM in suspected patients but radiologic findings are diverse. This could be in part because IGM is not a common condition and most of the clinical studies regarding the imaging findings in this disease have had a very small sample size.^{4,9} Since ultrasonography is widely used to assess breast lesions in young women and IGM mostly involves females of reproductive age, most of the patients with IGM undergo ultrasonography before diagnosis. However, due to the rare nature of this disease, there is a small body of evidence available on the ultrasonographic findings of the IGM. The most common ultrasonographic finding of IGM is reported to be a heterogeneous and hypoechoic mass with irregular shape and ill-defined margin.^{9,10}

This study aims to present the ultrasonographic findings of a relatively small series of patients diagnosed with IGM.

MATERIAL AND METHODS

This study involved a total of 26 untreated female patients with confirmed clinical and pathologic diagnoses of IGM diagnosed between 2020 and 2022. We evaluated the ultrasound images and clinical history of patients with BI-RADS 4 findings with the final pathology of IGM in a retrospective manner. The study protocol was approved by the Institutional Ethics Committee (IR.IUMS.FMD.REC.1400.224). All the patients referring to the breast clinic of Firuz Abadi Hospital who had suspicious findings in ultrasound or mammography and undergone core needle biopsy and a confirmed pathological diagnosis of IGM were included in this study. The study was introduced to them and a predesigned informed

consent form was obtained from them. Patients with a previous history of any other breast disease including other types of mastitis, biopsy, surgery, or malignancy and a history of treatment for IGM and pathology of cancer were excluded. None of the patients were in the pregnancy phase. All the included patients underwent breast ultrasonography with a linear-array transducer with a center frequency of 7.5MHz on a Voluson 6 machine and were then classified according to BIRADS classification by an accomplished radiologist. Also, the clinical characteristics and physical findings of each patient were recorded separately. Since this study only consisted of patients with IGM and their ultrasonographic findings, only descriptive statistics were used. All the data were analyzed using SPSS, version 26.

RESULTS

Clinical findings

Overall, 26 patients were included in the analysis (Table 1). The age range of the patients was 24 to 52 years old with an average of 34.81 (6.49). Out of all the included patients, 21 (80.8 %) had left breast involvement and no patient had bilateral involvement. About half of the patients (53.8%) reported pain as a presenting symptom. The most common physical finding was a palpable mass (in 53.8% of the cases) and only one patient showed signs of skin retraction. Skin redness, swelling, and sinus tract formation were other common presenting signs.

Us findings

Out of the 26 included patients, a distinct mass in the ultrasonographic examination was seen in 17 of them and the most common mass shapes were oval and irregular both with a frequency of 47.1%. Mass margins were mostly indistinct (70.6%), with angular and circumscribed margins also seen in the patients. The masses had mostly heterogeneous internal echoes (71.4%). Increased echogenicity of subcutaneous and perilesional fat were a common finding (84.6%). A few of the cases had non-mass hypoechoic/heteroechoic areas in the ultrasonographic examination (26.9%). In total, 7 patients had multiple irregular hypoechoic collections and a single irregular hypoechoic collection was seen in only 2 of them. A few of the patients had peripheral vascularity in their lesion (30.8%) but internal vascularity was an uncommon finding (7.7%). Posterior acoustic enhancement was the most commonly encountered posterior feature in the patients (57.7%), with 3 of the cases showing mixed pattern features. All the patients except 4 showed no signs of lymphadenopathy while one of the patients showed suspicious appearing lymph node with



squeezed hilum. Skin thickening was also seen in about a third of the cases (34.6%) and sub-cutaneous collections were detected in 19.2% of the patients. All the 26 patients' imaging findings were classified as BIRADS 4a or b. Figure 1 demonstrates an example of ultrasonographic imaging of one of the patients in the study and describes its features in detail. Other details could be seen in Table 2.

Table 1. Clinical characteristics and physical findings of the patients diagnosed with IGM

Clinical findings	N= 26
Involved side, n (%)	
Left	21 (80.8)
Right	5 (19.2)
Pain, n (%)	14 (53.8)
Physical findings, n (%)	
Palpable mass	14 (53.8)
Skin redness	11 (42.3)
Swelling	11 (42.3)
Sinus tract	3 (11.5)
Skin retraction	1 (3.8)



Figure 1. The ultrasound of a 36-year-old female diagnosed with idiopathic granulomatous mastitis (IGM) who presented with pain and redness in the left breast. The ultrasound shows an ill-defined oval hypoechoic heterogeneous mass with tubular extensions (arrow).

DISCUSSION

Overall, IGM is a diagnosis of exclusion requiring histopathologic evaluation of the biopsy breast issue. The main etiology is uncertain but the current theories are in favor of an inflammatory response within the breast tissue to the secretions leaked from the ductal system.

IGM is more prevalent in women of childbearing age; however, some studies report it in patients of uncommon ages, with one case of IGM reported in an 11-year-old girl.¹¹ Following the reported average age of 32 to 34 years in other studies, our study showed an average age of 34.8 in the examined cases.¹² This finding is in contrast with the higher age range in the patients with inflammatory breast carcinoma, with a mean age of 62.¹³ That is an important finding, as IBC is one of the main differential diagnoses of IGM. In our study, the most clinical manifestations were

palpable mass, redness, and swelling which were consistent with previous studies.^{2,14-16} In contrast to some studies, skin thickening and fistula were not common.^{17,18}

Importantly, the ultrasound features were mostly hypoechoic oval/irregular shapes with indistinct margin and posterior enhancement when IGM was presented as a mass.¹⁰ These findings are consistent with the study of Alikhasi *et al.* and the findings that Kaviani *et al.* reported.^{10,18} Unclear margins may be due to the inflammatory nature of the mentioned masses. Posterior enhancement could be because of internal cystic areas and mass-like lesions containing dense secretion which increased through transmission. In our study, most of the patients (21 cases, 80%) had left breast lesions, in line with the study by Omranipour *et al.*, where 56% of the inspected cases had left breast involvement. However, several studies reported more occurrences on the right side with a frequency of 61–69%¹². None of the patients in this study had a bilateral breast involvement which, according to other previous studies, is indeed a rare condition.^{1,2,12,19}

Core needle biopsy and pathologic assessment are gold standards for the diagnosis of IGM while ultrasonographic features are variable in IGM. Previous studies have reported that the common presentation of IGM in ultrasound imaging is the presence of an irregular hypoechoic mass with tubular extension and interconnecting tracts, consistent with our study.^{1,4,12,20}

Other ultrasonographic features of IGM include irregular hypoechoic collections, duct ectasia, edema, and skin thickening as well as the presence of lymph nodes with a thick cortex. The mentioned findings are not exclusive to IGM.

In this study, all patients (100%) received a BI-RADS 4 classification according to sonographic imaging which is in disagreement with the study by Yildiz *et al.*, in which most of the cases were classified as BI-RADS 3.²¹ The difference could be due to the fact that we included the patients with suspicious ultrasound findings, who had undergone biopsy-proven IGM with available pathological data.

The tubular extension along with mass formation is the most common feature in some studies up to 59% of cases^{4,8,17,19,21-23}, while in our study it occurred in 34% of cases. This finding may be due to the interlobular extension of this disease.²⁴ In conclusion, tubular extension and subcutaneous collections which were seen in IGM are in favor of this entity, suggesting that these findings may be able to differentiate IGM from inflammatory breast carcinoma in ultrasonography, although the gold standard of the diagnosis for this disease is still pathological examination.



Table 2. Ultrasonographic findings of the patients diagnosed with IGM

Finding	n = 26
Mass shape, n (%)	
Oval	8 (47.1)
Irregular	8 (47.1)
Round	1 (5.9)
Mass margin, n (%)	
Indistinct	12 (70.6)
Angular	3 (17.6)
Circumscribed	2 (11.8)
Non-mass heteroechoic area, n (%)	7 (26.9)
Increased fat echogenicity, n (%)	22 (84.6)
Internal echo, n (%)	
Heterogenous	15 (71.4)
Hypoechoic	6 (28.6)
Internal vascularity, n (%)	2 (7.7)
Irregular hypoechoic collection, n (%)	
No collection	17 (65.4)
Multiple	7 (26.9)
Single	2 (7.7)
Lymphadenopathy, n (%)	
No lymphadenopathy	22 (84.6)
Reactive	3 (11.5)
Squeezed hilum	1 (3.8)
Peripheral vascularity, n (%)	8 (30.8)
Posterior features, n (%)	
No posterior feature	7 (26.9)
Enhancement	15 (57.7)
Mixed pattern	3 (11.5)
Posterior shadowing	1 (3.8)
Skin thickening, n (%)	9 (34.6)
Subcutaneous collection, n (%)	5 (19.2)
Tubular extension, n(%)	9 (34%)

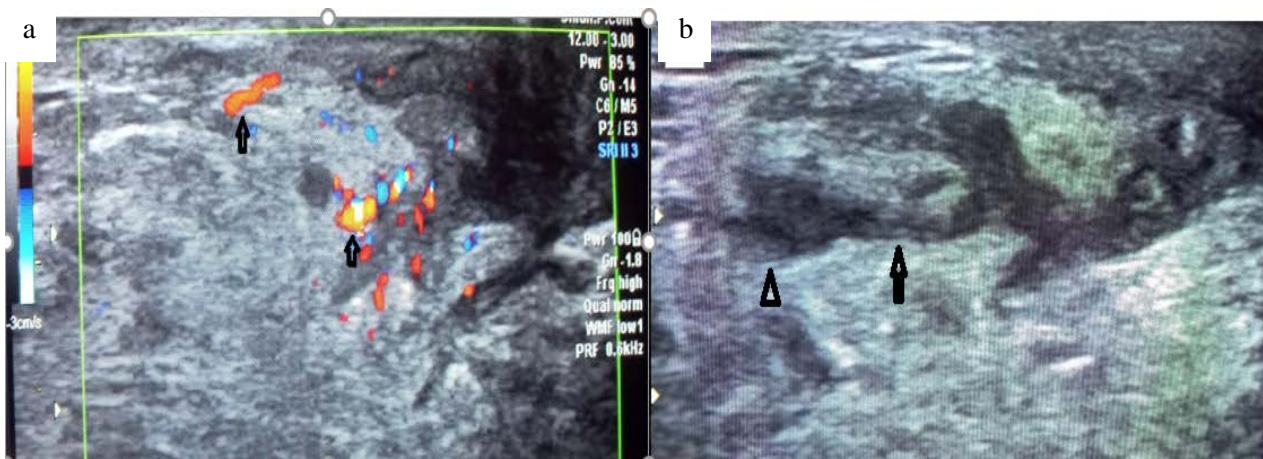


Figure 2. IGM in a 43-year-old woman who had a tender mass in the left breast medial part. **(a, b)** At the ultrasound, Heterogeneous breast tissues with areas of irregular hypoechoogenicity (arrowhead) with tubular extension (long arrow) and significantly increased vascularity in Doppler evaluation (small arrow) were observed. The findings were classified as representing a BI-RADS category 4 lesion, which was suspected of being infective mastitis with low suspicion for malignancy.



Doppler US images mostly showed the peripheral hypervascularity of the surrounding inflamed tissue in about 30% of cases, in line with the previous studies.^{19,25,26} Internal vascularity in 7% of cases could be due to microvasculature of granulation tissue and developing fat necrosis. Some less common IGM features in ultrasound included heterogeneous non-mass areas, a circumscribed hypoechoic mass, and posterior shadowing, which were seen in other studies.^{8,22,27}

Interestingly, the increased echogenicity of perilesional fat in 84% of cases was seen in the present research, although pathologically the inflammation is usually limited to the breast lobule in previous studies and generally spared the adjacent fat tissue.²⁸ This finding could be seen in other DDx and appears non-specific. Subcutaneous increased fat echogenicity and obliteration has been reported in some studies.²⁹

Limitations

The main limitation of this study was the small sample size because of the rarity of IGM. Another one was not failure to assess other modalities such as mammography or MRI. It could be because the patients were mostly young and their diagnosis had been confirmed by biopsy before and most of them had no need to perform other imaging modalities.

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CONCLUSION

In the ultrasonographic findings of IGM, augmented echogenicity of subcutaneous and perilesional fat were seen in 84.6% of cases, even though in the previous studies, perilesional fat edema has not been mentioned. In this study, other observations such as tubular extension, subcutaneous collection, indeterminate irregular masses, and collections were made in the ultrasound features of IGM. They could contribute to the diagnosis of IGM in a proper clinical setting.

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CONFLICT OF INTEREST

There are no conflicts of interests to be declared by the author.

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ETHICAL CONSIDERATIONS

This study was performed at Firuz Abadi Hospital research center and the study protocol was approved by the Institutional Ethics Committee.

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