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Idiopathic Granulomatous Mastitis and Other Types of Mastitis; Comparison of Ultrasound Findings

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ABSTRACT

Idiopathic granulomatous mastitis (IGM) is a chronic autoimmune inflammatory condition that can negatively affect patient psychology, that effective diagnostic protocols and treatment plans have not yet been established. Since the treatment protocols used differ, other causes of mastitis should be excluded. The purpose of this study was to compare ultrasonography (US) findings of IGM with type of the other mastitis (OM) to identify the imaging signs essential for a correct differential diagnosis.

This retrospective study was approved by the University Ethics Committee. This study was between August 2017 and August 2018. Parenchymal distortion and no discrete mass, mass-like lesions with indistinct borders, tubular connections, duct ectasia-periductal thickening, skin thickening and presence of an abscess were evaluated in US for each breast lesion.

The fifty-seven patients with IGM and 38 with OM were included in the study. The mean age was 35.2±8.4 and 43.6±12.5 years for those with IGM and OM, respectively. US showed tubular connections (43(75.4%)) with finger-like projections that tended to coalesce (P<0.01) and mass-like hypoechoic lesions (51(89.5%)) with irregular margins in IGM. Most cases of OM, 37 (97.4%), had mass-like lesions with indistinct borders.

The US findings of IGM sometimes overlap with types of OM. Although core biopsy is typically diagnostic, US findings are very useful in the differential diagnosis of IGM and OM. Especially, observation of tubular-related hypoechoic mass-like lesions may suggest IGM in the reproductive age patient with chronic mastitis.

Keywords: Idiopathic granulomatous mastitis, mastitis, ultrasonography

Introduction

Idiopathic granulomatous mastitis (IGM) is a rare inflammatory breast disease mimicking carcinoma and other types mastitis (1-4). The chronic process, which is often unresponsive to treatment, sometimes skin ulceration, fistulization and inflammatory discharge affect the psychology of patients negatively, the majority of whom are young women of reproductive age and continues to be an important cause of morbidity in young women. The diagnosis is based on a histopathological finding of non-caseous granuloma and the exclusion of other granulomatous diseases. All inflammatory diseases of the breast are generally called mastitis; however, their aetiologies differ (1-3,5,6). The response of IGM to steroid treatment suggests that it is an autoimmune disease (2,3). It is important to differentiate IGM from other mastitis (OM), as the treatments vary markedly and other causes of mastitis should not receive steroid treatment (2). IGM must be differentiated from chronic inflammatory breast diseases such as plasma-cell mastitis, Wegener's granulomatosis, a ruptured cyst, sarcoidosis, fat necrosis, tuberculosis, carcinoma, ductal ectasia, and fungal infections (6,7). Clinically, due to the presence of nonspecific symptoms such as unilateral breast mass, pain, and skin lesions, its diagnosis often requires histopathology to rule out other differential diagnoses (8).

There are reports that IGM cannot be differentiated from OM based on imaging characteristics (7,8). Such as mammography, doppler ultrasonography, and magnetic resonance imaging are inadequate for making a diagnosis, while greyscale US may show specific findings in some patients (5).

Since US is generally used for the basic assessment of young females with palpable breast lesions, most mastitis patients undergo US examinations. The most common US findings in these patients are heterogeneous hypoechoic ill-defined lesions with tubular extensions (3,5,7,8).

To our knowledge, however, no study has analysed USs ability to differentiate IGM from OM. This study assesses the US findings of IGM and OM.

Material and Methods

Patients: This retrospective study was conducted in the Breast Radiology Unit of the Department of Radiology of the University hospital at Van YYU. The study protocol was reviewed and approved by the

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Table 1. Comparison of the clinical features of IGM and OM

		IGM n (%)	OM n (%)	Total n (%)	P
Mean Size	0–2 cm	8 (14%)	17 (44.7%)	25 (26.3%)	0.01
	Over 2 cm	49 (86%)	21 (55.3%)	70 (73.7%)	
Fistulae	Absent	28 (49.1%)	36 (94.7%)	64 (68.4%)	0.01
	Present	29 (50.9%)	2 (5.3%)	31 (31.6%)	
	Total	57 (60%)	38 (40%)	95 (100%)	

IGM, idiopathic granulomatous mastitis; OM, other mastitis

Table 2. Ultrasound Findings of IGM and OM

	IGM n (%)	OM n (%)	Total n (%)	P
Parenchymal distortion with acoustic shadowing and no discrete mass	39(68.4%)	11(28.9%)	50(52.6%)	0.001
Calcification	2(3.5%)	8(21.1%)	10(10.5%)	0.006
Axillary lymph node	20(34.1%)	6(15.8%)	26(27.4%)	0.04
Mass-like lesions with indistinct borders	51(89.5%)	37(97.4%)	88(92.6%)	0.15
Tubular connections	43(75.4%)	4(10.5%)	47(45.3%)	0.001
Abscess	28(49.1%)	7(18.4%)	35(36.8%)	0.02
Duct ectasia, periductal thickening	8(14%)	17(44.7%)	25(26.3%)	0.01
Skin thickening	34(59.6%)	6(15.8%)	40(42.1%)	0.001

IGM, idiopathic granulomatous mastitis; OM, other mastitis

University Ethics Committee (Date, 12/04/2019; Number, 2019/07-01). Due to the retrospective nature of the study, patient consent was waived. The study included patients with mastitis histopathologically diagnosed as a result of tru cut biopsy between August 2017 and August 2018. The US records of all patients were accessed through the Picture Archiving and Communication System (PACS). Lesion side, presence of a fistula, lesion size, and presence of a palpable mass were recorded for all patients. The exclusion criteria were (a) other benign breast lesions and (b) malignant breast lesions.

Ultrasound Examination: The US and US-guided biopsies of the patients were performed by a single radiologist (NT), and recorded on PACS for prospective evaluation. Then US findings of the patients were reevaluated in the PACS by single radiologist (AMG) who were kept blinded to the results of the histopathological examination. Both radiologists had 10 years of experience in general radiology and 4 years in breast radiology.

US was performed with the patients in a supine position, with the breast and axilla exposed and their hands behind their heads. The US findings of each lesion were evaluated as follows: parenchymal distortion with acoustic shadowing and no discrete mass; mass-like lesions with indistinct borders; tubular connections; duct ectasia-periductal thickening; skin thickening; lymphadenopathy; and presence of an abscess.

Statistical analysis: Descriptive statistics used for the continuous variables included the mean, standard deviation and range, while number and percentages were used for categorical variables. The Student's *t*-test was used to compare IGM and OM group means for the studied variables. The Chi-square test was used to determine the relationships between categorical variables. The level of statistical significance was considered to be $p<0.05$. SPSS (Chicago, IL.ver. 13) was used for all statistical computations.

Results

The ninety-five mastitis patients were included in the study. The analyses included 57 (60%) women diagnosed with IGM (mean age 35.2±8.4 years) and 38 (40%) diagnosed with OM (mean age 43.6±12.5 years). The IGM patients were younger ($P<0.05$). There was no difference in the frequency of occurrence both diseases in the right or left breast ($P>0.05$). Palpable masses, fistulas, and abscesses were more common in IGM ($P<0.05$) (Table 1).

IGM that usually envolving an entire quadrant of the breast tissue, often presence of a large inflammatory lesion, parenchymal heterogeneity and abscess

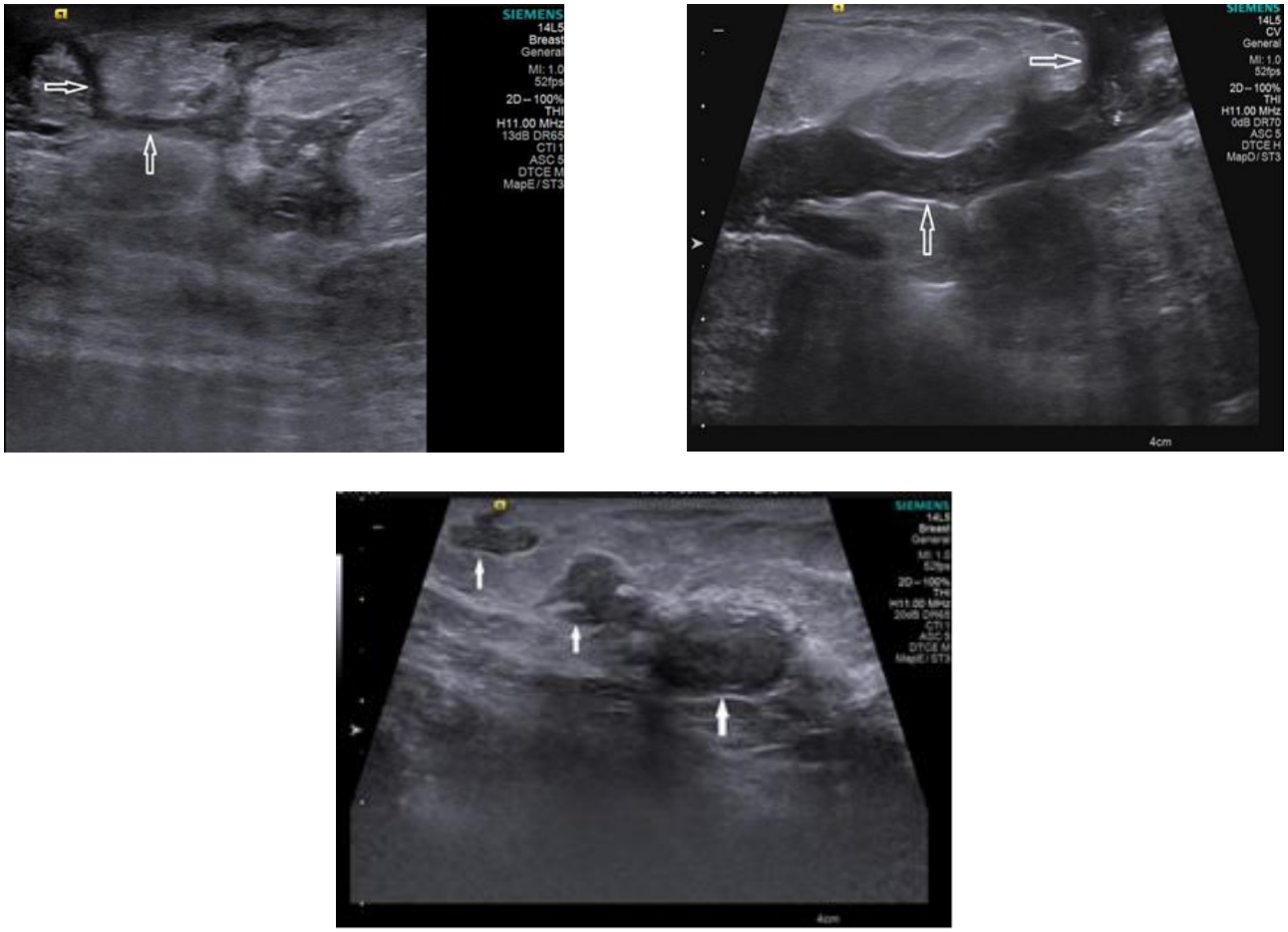

Fig. 1. Idiopathic granulomatous mastitis: A 30-year-old patient; a-b) Tubular connection extending between the breast lobules, in the form of intense collections (white arrow up), and fistulization tracts towards the skin (white arrow to right). c) The grayscale US image shows a mass-like lesions with an irregular, indistinct border (white arrows)

formation appeared with. US showed tubular connections with finger-like projections that tended to coalesce (P<0.01), mass-like hypoechoic lesions with irregular margins (P>0.05), and parenchymal distortion with acoustic shadowing and no discrete mass (P<0.01) (Figure 1a-c). In addition, some patients had skin thickening, abscesses, and axillary lymph nodes with cortical thickening.

Of those with OM, 31 (81.6%) had periductal chronic inflammation, 2 (5.3%) each had fungal granulomatous mastitis, 2 (5.3%) each had caseous granulomatous mastitis, and 2 (5.3%) each had lactational mastitis, and 1 (2.6%)had plasma-cell mastitis. Of the patients with OM, 37 (97.4%) had mass-like lesions with indistinct borders. In patients with lactational and plasma cell mastitis, large abscesses have accompanied the edematous-heterogeneous breast tissue in a local area. The US revealed skin and subcutaneous fat have thickened and became hyperechoic (Figure 2). The lesions of caseous granulomatous mastitis were heterogeneous solid lesions with well-defined margins and punctuate hyperechogenic lesions scattered across hypoechoic areas (Figure 3). Periductal chronic inflammation patients complained of noncyclical pain in a focal breast area. US examination at the focal painful breast region revealed abnormally thickening around the ectatic ducts. US examination revealed hypoechoic inflammatory tissue persisted along the outside of the duct (Figure 4a) and and these lesions were mostly noticed as incidental in US. Calcification was rarely observed in either group, although the incidence of calcification was higher in patients with OM (Figure 4b). Ductal ectasia and periductal thickening were more common in patients with OM (Table 2).

Discussion

In our study, the IGM lesions were multiple, irregular, lobulated hypoechoic masses with tubular connections on US, consistent with the literature (5, 7-10,11). Compared to OM, IGM patients had severe disruption of the parenchyma and acoustic shadowing areas without discrete masses. Periductal chronic inflammation was the most common type of mastitis among OMs. The duct ectasia, periductal thickening areas, solid nodules and calcification areas were

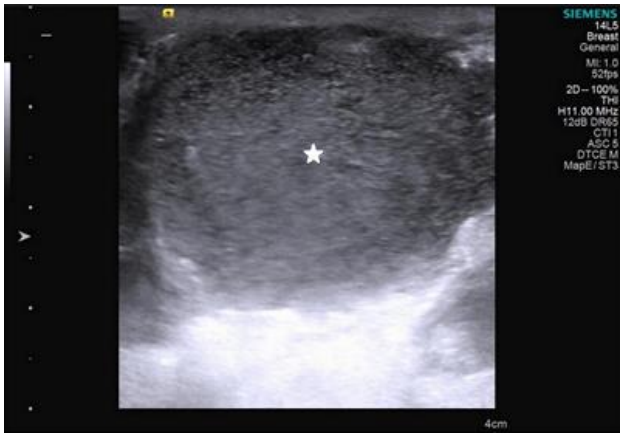

Fig. 2. Breast abscess in a 28-year-old breastfeeding woman. US shows a heterogeneous hypoechoic cystic mass with well-defined borders (white star)

frequently accompanied the periductal chronic inflammation.

Larsen et al. reported a hypoechoic, irregular mass with multiple, tubular projections suggestive of IGM in 59% of 54 women, while we found a higher rate of 75.4% (10).

Mass-like lesions are a common feature of both groups, so this finding was not specific for IGM (7). However, the nodules observed in patients with OM tended to have more regular margins than those in IGM. Similar to our work, Cheng et al. detected mass-like lesions in all types of mastitis (7). Periductal chronic inflammation that does not completely resolve and becomes chronic can present as a solid nodule sonographically (12).

In our study, calcifications were more common in OM than IGM, and the observed calcifications were mostly localised within mass-like lesions and in periductal areas. A patient with periductal chronic inflammation may develop intraductal calcifications and periductal fibrosis (12). The intraductal calcifications may be seen at an early stage when they are still incomplete. Early-stage calcifications are indistinguishable from those of ductal carcinoma in situ (DCIS), therefore, most mastitis at this stage are evaluated by biopsy.

OM cases were few in number, except for periductal chronic inflammation. Two cases of fungal mastitis were observed in our series: one was in a complex cystic structure (containing solid areas) and the other involved fluid collections that extending between the breast lobules. The difference with IGM was that it contained much larger cystic areas. In half of the IGM patients, abscesses were seen as fluid collections in inflamed areas. Abscess formation was more common in IGM, and the presence of a fistula helped with the diagnosis (13). Illman et al. demonstrated sonographically that fungal infections (blastomycosis,

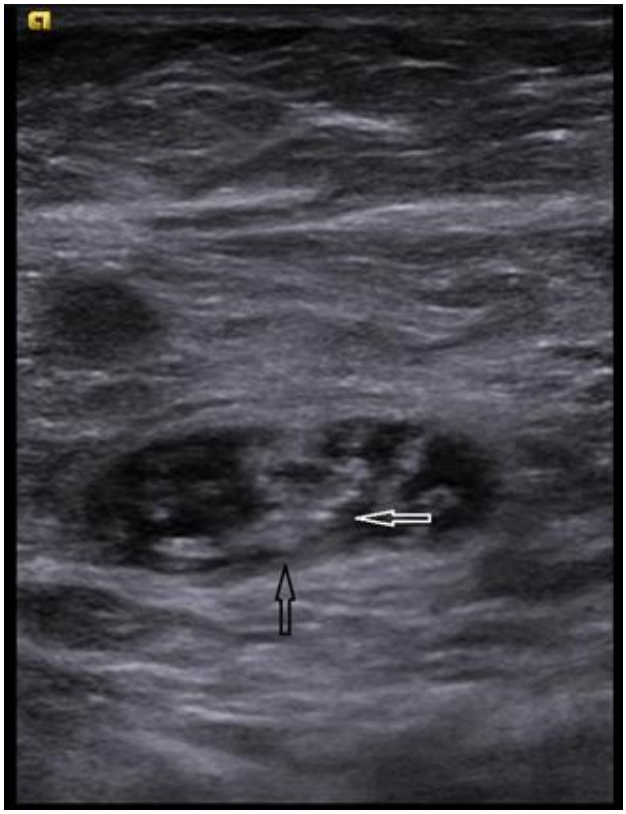

Fig. 3. US images of tuberculous mastitis patient in the fifth decade; masses with heterogeneous hypoechoic, smooth lobulated contour (black arrow), with punctuating echogenicities (white arrow)

cryptococcosis, histoplasmosis and actinomycosis) are usually characterized by a lobular, complex cystic mass with irregular or well-defined margins and may be accompanied by skin thickening (14). However in our study, skin thickening was found more in IGM patients than in OM patients. This condition may be explained by the fact that the majority of the OM patient group consists of periductal chronic mastitis patients.

McKeown et al. classified tuberculosis infections of the breast into five categories: nodular mastitis, disseminated mastitis, sclerosing mastitis, mastitis obliterans and acute miliary mastitis (11). Nodular mastitis presents as a hypoechoic, fibroadenoma-like lesion with well-defined margins and a poor blood supply on Doppler US (11). Although patients with tuberculosis mastitis were included in the nodular mastitis category in our study, multiple, echogenic millimetre foci were observed at the lesion periphery. This appearance is thought to be related to areas of caseous necrosis. Sarcoidosis, histoplasmosis, Wegener's granulomatosis, tuberculosis, typhoid fever, brucellosis and fungal and parasitic infections can all lead to granulomatous mastitis (2). Tuberculosis is important in the differential diagnosis of IGM, due to the effects of corticosteroid therapy. A diagnosis of tuberculosis or other infections

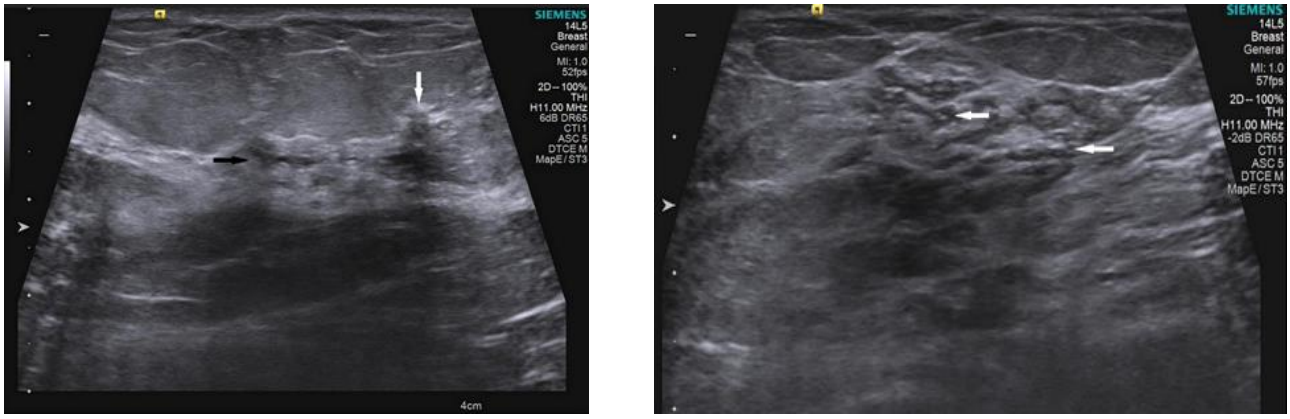

Fig.4. a) A 40-year-old woman with histopathology of periductal inflammation in the breast; periductal thickening (white arrow) and ductal dilatation (black arrow). **b)** Microcalcifications have observed adjacent to the ductal dilatation areas (white arrows)

requires serological tests and a histological examination of the affected tissues using special dyes (15).

There was only one case of plasma cell mastitis in our patient group. In the patient with plasma cell mastitis, a large abscess focus was observed in one quadrant of the breast, extending between the lobules. It has been reported that the affected ducts may cause mastitis obliterans (16). The fact that plasma cell mastitis affects a large quadrant of the breast and associated fluid collections can be confused with IGM. However, interconnected tubular extensions and mass-like lesions in IGM patients are demonstrative images that should be kept in mind in differential diagnosis.

The retrospective nature of the study and small numbers of patients in the OM subgroups are the most important limitations of our study. However, there is a need for prospective studies comparing IGM findings in US with, especially with mastitis types causing mastitis obliterans affecting large breast quadrants.

IGM should be considered in patients presenting with a breast pain and mass suspicion, particularly in young reproductive age women, if US shows mass-like lesions with irregular margins accompanying tubular connections, the presence of an abscess and fistula.

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