

Radiologic findings of idiopathic granulomatous mastitis

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Abstract

Aim: To describe the radiological findings of idiopathic granulomatous mastitis (IGM). **Material and methods:** Radiologic findings of 30 women with histopathological diagnosis of IGM were retrospectively evaluated. All had breast feeding history. All the patients had ultrasonography (US), with 12 of them having additional Doppler US. Of 30 patients, 11 had mammography (MG) and 5 MRI. **Results:** US showed multiple irregular hypoechoic masses and collection areas with tubular connections in 25 of 30. The collection area with low-level internal echoes but without tubular connections, suggesting an abscess were seen in 2 of 30 (6.6%); a hypoechoic mass with an indistinct border in 2 of 30 (6.6%); multiple milimetric hypoechoic nodular masses in 1 of 30 (3.3%). On MG, normal findings were noted in 5 (45.4%); focal asymmetric density in 4 (36.4%), parenchymal distortion in 1 (9%) and diffuse asymmetric opacity with trabecular thickening in 1 (9%) of 30 patients. On MRI, segmental T2 hyperintensity with contrast-enhancement on T1 were seen in 4 of 5 (80%). An enhancing T2 hypointense mass with irregular margin was present in 1 of 5 (20%). Time-signal intensity curve of lesions showed slow enhancement in 1 and moderate in 4 of 5 patients. **Conclusions:** In IGM, MG findings were nonspecific. In US, multiple irregular hypoechoic masses and collections with tubular connections with fingerlike aspects, and fistulae formation to the skin in patients with breastfeeding history suggested IGM rather than carcinoma. Due to the limited number of patients, no conclusion was reached regarding MRI of IGM.

Keywords: idiopathic granulomatous mastitis, breast ultrasonography mammography, MRI

Introduction

Idiopathic granulomatous mastitis (IGM) is a rare inflammatory breast disease with unknown etiology, first described as a specific entity in 1972 [1]. IGM tends to develop in the reproductive age group or in patients with history of oral contraceptive use [1,2]. The most common signs and symptoms are unilateral breast mass, pain, and skin lesions [1-3]. Noncaseating and multiple well-defined granulomas distorting the normal breast lobules are the typical features of IGM in histopathological examination [3]. The etiology is controversial but the autoimmune pa-

thology is favored [4]. IGMs are misdiagnosed as breast carcinoma in both clinically and radiologically. The presence of the skin fistulas can help in the differential diagnosis but the IGM is a diagnosis of exclusion and only histopathology can establish the definitive positive diagnosis.

The purpose of this study was to describe the imaging features of IGM using ultrasonography (US), mammography (MG), and magnetic resonance imaging (MRI) and to evaluate the value of imaging modality in the diagnosis of IGM.

Material and methods

We retrospectively evaluated radiologic findings of 40 women (mean age 33 years; range between 21-50 years) with a diagnosis of granulomatous mastitis confirmed by histopathology between November 2010 and March 2013. In 10 patients, the final diagnosis was of tuberculous mastitis histopathologically; therefore they were excluded from this study.

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Informed consent was not acquired from all patients due to the retrospective design of the study. The study received institutional review board approval.

US examination of bilaterally breast and axilla was performed in all 30 women with a 5-13 MHz linear transducer (Antares, Siemens, Erlangen, Germany). All masses were evaluated using the US criteria from the American College of Radiology: shape (round, oval, irregular), margins (circumscribed, indistinct, speculated, or microbulated), and echogenicity (hypoechoic, isoechoic, hyperechoic or mixed) [5]. Twelve of 30 were categorized based on color Doppler-US findings.

MG examinations were performed in all patients above the age of 35 years (n=9) in craniocaudal and mediolateral oblique positions (Mammomat Inspiration, Siemens, Erlangen, Germany). In two patients under 35 years of age MG was performed due to a clinical suspicion of malignancy. As a result, a total 11 of 30 patients had MG results.

Five patients underwent breast MR imaging. MRI was performed using 1.5 Tesla unit (MAGNETOM Avanto 1.5 T, Siemens, Erlangen, Germany), and a dedicated 4-channel bilateral breast coil. Axial scout images, conventional axial T1-weighted (TR/TE), T2-weighted (TR/TE) and TRIM and diffusion weighted images (b values of 50, 400, 1000 s/mm²) were obtained. Before and after i.v. contrast material injection 6 sequential fat-suppressed 3D T1-weighted images were obtained and subtraction was performed. Contrast used was 0.1 mmol/kg of gadolinium-DTPA (Omniscan) intravenously. Morphological features and contrast enhancement patterns of the lesions were evaluated.

Based on the radiologic and clinical findings, most of the lesions were diagnosed as mastitis and BIRADS 3. For a final differential diagnosis (including bacterial or tuberculosis mastitis) the biopsy was considered to be necessary, especially for treatment planning. Biopsy was performed under US-guidance with a core biopsy using with 14 G needle. Additionally, the tuberculosis mastitis was excluded by PCR, BACTEC culture, microscopic examination with specific Erlich-Ziehl-Neelsen performed on tru-cut specimen.

Our study is a descriptive study and with the exception of percent calculation, we did not perform statistical analysis due to the limited number of patients.

Results

Clinical findings

All patients had a breastfeeding history; the time to presentation in relation to the patient's most recent birth ranged from 11 months to 4 years. No patient had a history of smoking, autoimmune disease, and tuberculosis.

In all patients, a palpable painful breast lump was the initial clinical manifestation and 9 cases had abscess drainage in their history. Additional findings include thickening of the skin (n=18), fistula formations (n=15), or axillary lymphadenopathy (n=18). In four patients irregular and hard breast masses were found and they were suspicious for breast cancer.

Ultrasonography findings

The diameter of mass lesions ranged from 21 to 100 mm. In 25 of 30 patients (83.3%), there were multiple irregular hypoechoic masses and collections with tubular connection with fingerlike aspects and also increased parenchymal echo pattern in the affected breast (fig 1a, 1b). In 2 of 30 (6.6%), there were collection areas with low-level internal echoes consistent with abscess but without tubular connections (fig 1c). These 27 masses were assessed BI-RADS® categories 3. In 2 of 30 (6.6%) patients, hypoechoic mass-like lesions compared with surrounding normal breast parenchyma with indistinct border were noted. In 1 (3.3%) patient multiple vertically oriented milimetric-sized hypoechoic nodular structures with indistinct border in the same segment were present (fig 1d) (Table I). These last 3 masses were assessed BI-RADS® category 4.

All the lesions were located at the periphery of the breast. An extension towards the retroareolar space was found in 15 patients due to the large size of mass lesions. Fistulae were detected in 15 of 30 (50%) women and skin thickening in 18 of 30 (60%) women. Unilateral reactive axillary lymph nodes (thick cortex and echogenic fatty

Table I. Ultrasonographic features of idiopathic granulomatous mastitis

Ultrasonography findings (n=30)	n (%)
Multiple irregular hypoechoic masses and collections with tubular connection with fingerlike aspects	25 (83.3)
Collection areas with low-level internal echoes consistent with abscesses	2 (6.6)
Hypoechoic mass-like lesion compared with surrounding normal breast parenchyma with indistinct border	2 (6.6)
Multiple milimetric hypoechoic nodular structures	1 (3.3)
Fistulae	15 (50)
Skin thickening	18 (60)
Evidence of unilaterally axillary lymph node involvement	18 (60)
Color Doppler sonography (n=12)	
Increased arterial and venous vascularisation	12 (100)

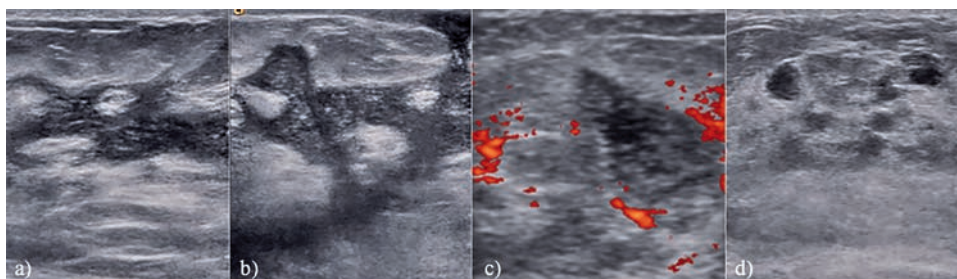


Fig 1. Ultrasonography images of idiopathic granulomatous mastitis in four different patient: a) and b) Increased echo in the affected breast parenchyma, multiple irregular hypoechoic masses and collections with tubular connection with finger-like aspects, and fistulae formation; c) Power Doppler sonogram demonstrate collection areas with low-level internal echoes consistent with abscess, increased flow within and around the lesion; d) Multiple hypoechoic nodular structures located in the same segment.

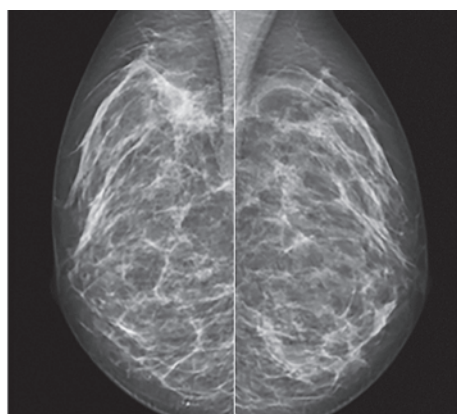


Fig 2. Idiopathic granulomatous mastitis of the left breast in a woman. Mammograms show focal asymmetric density.

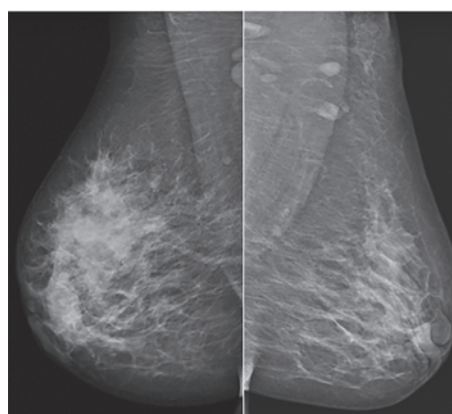


Fig 3. Idiopathic granulomatous mastitis of the right breast in a woman. Mammograms show diffuse asymmetric opacity with trabecular thickening.

hilum) were present in 18 of 30 (60%) women. The color Doppler US findings of 12 patients of 30 were available for retrospective evaluation. All demonstrated increased arterial and venous flow within and around the lesion.

Mammography findings

Eleven of 30 patients had MG. The breast density of all was ACR 3 or 4 types. In 5 of 11 (45.4%) patients no abnormality was demonstrated. The most frequent mammographic sign was focal asymmetric density which was detected in 4 of 11 women (36.4%) (fig 2). In one (9%) patient parenchymal distortion and in another (9%) patient diffuse asymmetric opacity with trabecular thickening were noted on MG (fig 3). MG findings of IGM are listed in Table II.

MRI findings

Only 5 of 30 patients had MRI. Segmental increased signal intensity on T2-w images with non-mass contrast enhancement on contrast-enhanced T1-w images was present in 4 of 5 (80%) (fig 4). In the center of T2 hyperintensity additional collections were detected

Table II. Mammographic features of idiopathic granulomatous mastitis

Mammography findings (n=11)	n (%)
Normal	5 (45.4)
Focal asymmetrically increased density	4 (36.4)
Diffuse asymmetrically increased density	1 (9)
Paranchymal distorsion	1 (9)

(around 3 cm). The time-signal intensity curve of all 4 masses demonstrated moderate enhancement (between 50%-90%) in an early phase. In a late phase (delayed phase) 2 lesions evidenced type 1 (signal intensity increase >10%) curve pattern and the other 2 lesions type 2 (signal intensity changed <10%) curve pattern. In one of 5 (20%) patients a hypointense mass lesion with irregular margin was noted on T2-w images. This mass showed slow (contrast enhancement under than 50%) contrast enhancement in an early phase and Type 1 curve pattern in a late phase of the time-signal intensity curve.



Fig 4. Idiopathic granulomatous mastitis of the left breast in a woman. a) Magnetic resonance images show multiple hyperintense collections, on segmental increased signal intensity on T2-w images; b) Non-mass contrast enhancement on contrast-enhanced T1-w images is present. There are additional collections smaller than 3 cm; c) Type I (persistent) enhancement curve is seen on time intensity curve.

Table III. MRI features of idiopathic granulomatous mastitis

MRI findings (n=5)	n (%)
Segmental increased signal intensity on T2-w images with moderate contrast enhancement on contrast-enhanced T1-w images	4 (80)
Hypointense mass lesion with irregular margin on T2-w images with slow contrast enhancement on post-contrast T1-w images	1 (20)

Treatment

Upon the diagnosis of IGM based on biopsy results, oral steroids were given to all the patients (prednisolone 16 mg/day). Effect of the steroids was evaluated on the 15th day by clinical examination and the dose was doubled in patients with no response (3 of 30 patients). Steroid treatment was continued for two months and then the patients underwent surgery with resection of the lesions. None of patients had a mastectomy. Frozen section was not applied and clear margins were decided by macroscopic examination of the specimen and palpation of the cavity. Follow up was done by clinical examinations. Although the follow up period was short (13.3 ± 4.1 months 1-19 months) there was no recurrence in this time period. Only one patient suffered from wound infection in the early postoperative period. Neither bleeding nor seroma was observed. Although treatment success seems to be 100%, we believe that our results have a bias due to the small group number.

Discussions

IGM is a rare benign inflammatory disease [1]. The histopathological feature of IGM is of non-caseating granulomatous mastitis. In addition to the demonstration of this finding, exclusion of probable histopathological conditions such as duct ectasia, foreign body granuloma, other granulomatous mastitis (e.g., tuberculosis) is required [6]. The etiology is unknown; the local inflammatory response to the extravasation of fat and protein rich secretions in the duct was suggested as a mechanism [7]. Other postulated causes for this benign condition are oral contraceptives and undetected organisms [2].

IGM seems to be associated with a history of pregnancy and is usually seen in 6 years following pregnancy. An autoimmune process was suggested in etiology [2,8-9]. This was confirmed in our study since all 30 patients had a history of pregnancy and their mean period between pregnancy and the presentation of IGM was 3 years. Granulomatous mastitis generally appears as a unilateral breast mass that may be associated with skin thickening, fistula formation, erythema, fever, or axillary lymphadenopathy [9-10]. In our study all cases presented with hard breast mass at periphery of the breast, and the presence of fistula was a helpful clinically diagnostic marker [11]. If the lesion was large the extension towards the retroareolar space could be seen. The most frequent US findings were multiple irregular hypoechoic masses and collections connected to each other with finger-like tubular hypoechoic structures (83.3%), similar to those reported in previous literature [2,8,12-16]. Ill-defined heterogeneous hypoechoic pattern compared with surrounding normal breast parenchyma was also another less common finding [17]. We noted this rare finding in 2 of 30 cases (6.6%). The two cases were initially misdiagnosed as malignancy on US.

US findings of IGM are nonspecific, but if patients have a breast feeding history and multiple irregular hypoechoic masses and collections connected to each others with finger-like tubular hypoechoic structures on US, the most plausible diagnosis is IGM [12,16].

As reported in previous literature [9,15,17], there is increased vascularisation in the vicinity of the IGM in Doppler US. However, the number of series in the literature are small and only 40% of our cases (12 of 30) had available Doppler US findings for evaluation.

IGM is a disease of reproductive age group; therefore, MG sensitivity is lower due to dense breast pattern in this age group, the MG findings being considered as nonspecific [2,8,12,15,18-19]. In almost half of the cases the MGs were negative, similar to literature. In the rest of the cases, nonspecific findings such as focal asymmetric density, diffuse asymmetric opacity with trabecular thickening, and parenchymal distortion were found.

Parenchymal distortion was not reported before [2,8,12] and microcalcifications was reported in only one study [17].

MRI findings of IGM were reported in only a few cases. IGM has a wide range of MRI findings including intensively and strongly enhancing masses, rim enhancement, and focal homogenous enhancing masses [12-14]. On MRI, the differential diagnosis between IGM and inflammatory breast cancer is difficult due to similar aspects. MRI findings of IGM are T2 hyperintensity, major contrast enhancement at subareolar region, moderate or slow enhancement in an early phase and increased enhancement pattern or plateau pattern in the late phase of contrast injection, absence of perifocal, prepectoral or pectoralis muscle edema and absence of findings suggesting pectoralis muscle invasion (nonvisualization of prepectoral fat planes or pathologic contrast enhancement of pectoralis muscle). These MRI findings together with an absence of mass on US and MG support the IGM [20-21]. In our study, MRI findings were similar to literature.

In 27 of 30 patients we had the suspicion for IGM based on imaging and clinical findings and the biopsy confirmed the lesion. All 27 patients were categorized as BI-RADS 3. There were only 3 patients misdiagnosed as malignancy. All three lesions showed characteristics properties for malignancy on US such as an indistinct border and vertical orientation, categorized as BI-RADS 4 and normal MG findings. In one of these cases MRI evidenced T2 hypointensity with slow enhancement in an early phase and increased enhancement in a late phase of contrast injection, excluding malignancy.

There are some limitations in this study. The first is that our study is a descriptive and retrospective study. The second refers to the fact that the study group is composed of highly selected patients. Thirdly there was a limited number of patients who had undergone MRI and Doppler US. Due to the limited number of patients, the statistical analysis could not be performed.

Conclusions

IGM is a rare benign disease with no specific features on MG. US finding can be helpful for diagnosis in which multiple irregular hypoechoic masses and collections with tubular connections with fingerlike aspects in a patient having a lactation history and presence of one or more fistulae to the skin would suggest IGM rather than carcinoma. A larger study group is needed for MRI characterization of IGM.

Conflict of interest: none

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