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## ORIGINAL ARTICLE

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# Imaging of Idiopathic Granulomatous Mastitis: a Retrospective Study

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### ABSTRACT

**Introduction:** The aim of this study was to review the clinical manifestations, imaging findings, and management of idiopathic granulomatous mastitis (IGM).

**Methods:** We retrospectively analysed the clinical and imaging findings of all women diagnosed with IGM at our tertiary care hospital from July 2012 to June 2019.

**Results:** Of the 29 women (31 breasts) included, 24 patients were of childbearing age. Nine of them had a history of breastfeeding within the past year. Twenty-four patients had been misdiagnosed as breast cancer or abscess initially. Nine patients were documented to have hyperprolactinaemia. Imaging findings were nonspecific, with the most frequent ultrasound finding of an irregular hypoechoic mass in 17 (54.8%) of 31 breasts, and the most frequent mammographic finding of a focal asymmetry in six (37.5%) of 16 breasts. Fine needle aspiration biopsy was diagnostic in four (23.5%) of 17 lesions. All 24 ultrasound-guided core biopsies were diagnostic. *Corynebacterium* species was found in four samples (12.9%). 16 patients (55.2%) were treated medically with a combination of steroids and antibiotics. Drainage was performed in 18 lesions (58.1%). Thirteen patients (44.8%) had a recurrence with a median follow-up of 21 months

**Conclusion:** IGM is a rare benign chronic inflammatory breast disease with no specific clinical or imaging features. Diagnosis should be made by biopsy based on the clinical presentation.

**Key Words:** Breast; Granulomatous mastitis; Inflammation

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**Data Availability:** All data generated or analysed during the present study are available from the corresponding author on reasonable request.

**Declaration:** The results of this study were previously presented at the European Congress of Radiology in 2020. Permission to re-use the figures was granted.

## 中文摘要

### 特發性肉芽腫性乳腺炎的影像學：回顧性研究

錢珮恩、羅承恩、林培榮

**引言：**回顧分析特發性肉芽腫性乳腺炎（IGM）的臨床及影像學表現和治療。

**方法：**回顧性分析2012年7月至2019年6月在本三級醫院診斷為IGM所有女性的臨床和影像學表現。

**結果：**納入的29名女性（31個乳腺）中，24名患者處於育齡期。其中9人在過去一年內有喂乳史。24名患者最初被誤診為乳腺癌或膿腫。9名患者被認為有高泌乳素症。影像學表現無特異性。最常見的超聲發現為不規則低迴聲腫塊，見於31個乳腺中17個（54.8%）。最常見的乳腺X線檢查發現為局灶性不對稱，見於16個乳腺中6個（37.5%）。17個病灶中有4個（23.5%）經細針抽吸活檢確診。所有24個超聲引導的核心活檢均提供診斷。在四個樣本中發現棒狀桿菌（12.9%）。16名患者（55.2%）接受類固醇和抗生素聯合內科治療。18個病灶（58.1%）進行了引流。中位隨訪時間為21個月，當中13名患者（44.8%）復發。

**結論：**IGM是一種罕見良性慢性炎症性乳腺疾病，沒有特定的臨床或影像學特徵。應根據臨床表現通過活檢作出診斷。

## INTRODUCTION

Idiopathic granulomatous mastitis (IGM), also known as granulomatous lobular mastitis, was first described by Kessler and Wolloch<sup>1</sup> in 1972. It is an uncommon benign chronic inflammatory disease of the breast. It is of unknown aetiology and primarily affects young women. Potential precipitating factors include pregnancy, lactation, oral contraceptive use, and hyperprolactinaemia. There is no well-established aetiology. It is characterised histologically by chronic granulomatous inflammation in the breast lobules without caseous necrosis. It should be differentiated from other causes of granulomatous breast disease such as plasma cell mastitis, granulomatosis with polyangiitis, sarcoidosis, foreign body reaction, tuberculosis, and fungal infections.<sup>2</sup>

Clinically, IGM typically presents as a breast mass that may be associated with mastalgia, skin changes such as thickening and sinus formation, or axillary lymphadenopathy,<sup>3</sup> which cannot be distinguished from breast cancer or infection.

In this retrospective study, we reviewed cases of IGM in a tertiary referral hospital in Hong Kong. The aim was to analyse the clinical, imaging, and pathological features of IGM and discuss the available treatment options.

## METHODS

This retrospective study was approved by Hong Kong West Cluster Research Ethics Committee and the requirement to obtain informed consent was waived. All consecutive patients who were diagnosed with IGM between July 2012 and June 2019 were identified from the hospital Radiological Information System.

Patient medical records were extracted from Electronic Patient Records and Radiological Information System to determine the clinical manifestations, pathological and microbiological results, imaging findings, and treatment plans.

Ultrasound examination of all involved breasts and axillae was performed with a linear 5.5-18 MHz probe (18L6 HD Transducer; Siemens, Erlangen, Germany). Mammography was performed in patients with suspicious ultrasound findings where appropriate. All imaging studies and procedures were performed by fellowship-trained breast radiologists. Tissue diagnosis was obtained by fine needle aspiration biopsy (FNAB), percutaneous ultrasound-guided core biopsy, or surgical excision under ultrasound guidance.

## RESULTS

### Clinical Manifestations

Between July 2012 and June 2019, a total of 29 women

(31 breasts) with a median age of 42 years (range, 25-58) had breast imaging performed in our institution and were subsequently diagnosed with IGM. Of the 29 women, 24 (82.8%) were of childbearing age. Five women (17.2%) were postpartum. Nine (31%) had been breastfeeding within the past year, with a duration ranging from 2 months to 2 years.

The reported duration of symptoms ranged from 3 to 56 days, with a median of 25 days. Common clinical presentations included breast mass, swelling, mastalgia, and erythematous skin changes, all of which can be seen in breast abscess or cancer. Associated ulceration and discharge were presented in two patients. Among the 29 patients, two were initially given an ultrasonographic and/or mammographic diagnosis of breast cancer, while 22 were initially diagnosed and managed as breast abscesses.

Nine (31%) patients were documented to have hyperprolactinaemia. Two were due to pituitary prolactinomas and four were due to antipsychotic drugs.

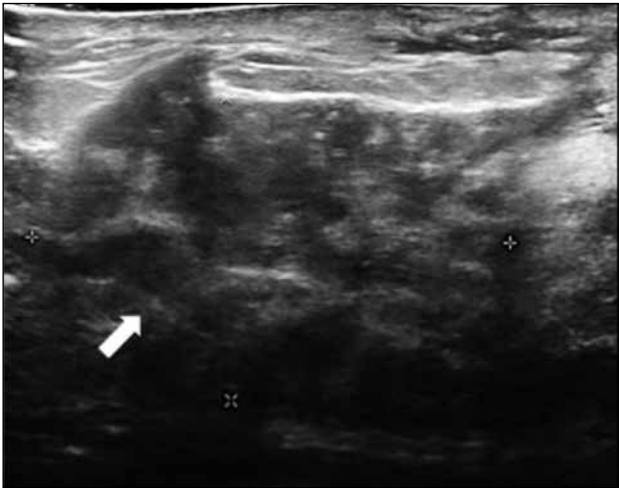
Imaging Findings

Among the 31 breasts included in the study, 31 received ultrasound examinations and 16 of them received mammography (Table).

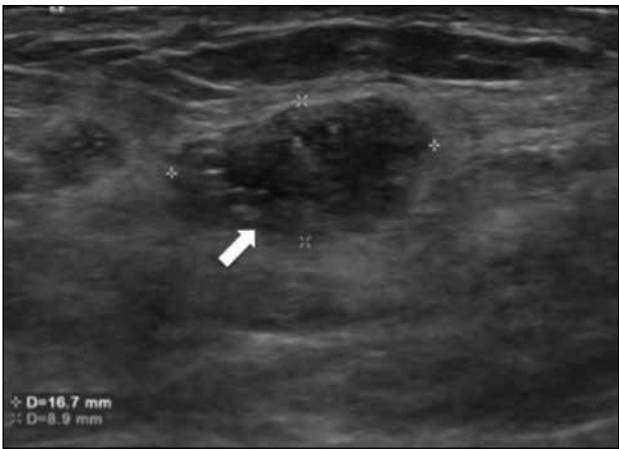
Among the 31 ultrasound examinations, 17 were reported as irregular hypoechoic masses with or without tubular extensions (Figure 1). The rest of the documented features were one circumscribed hypoechoic mass (Figure 2), 13 collections (Figure 3) and one parenchymal

**Table.** Ultrasound and mammographic findings of idiopathic granulomatous mastitis.

Findings	No. (%)
Ultrasound (n = 31 breasts)	
Irregular hypoechoic mass	17 (54.8%)
Abscess	13 (41.9%)
Circumscribed hypoechoic mass	1 (3.2%)
Parenchymal distortion with no discrete mass	1 (3.2%)
Skin thickening	11 (35.5%)
Axillary lymphadenopathy	4 (12.9%)
Sinus tract formation	4 (12.9%)
Nipple retraction	2 (6.5%)
Increased vascularity	9 (29.0%)
Mammography (n = 16 breasts)	
Focal asymmetry	6 (37.5%)
Irregular mass	4 (25.0%)
Skin thickening	4 (25.0%)
Normal finding	2 (12.5%)



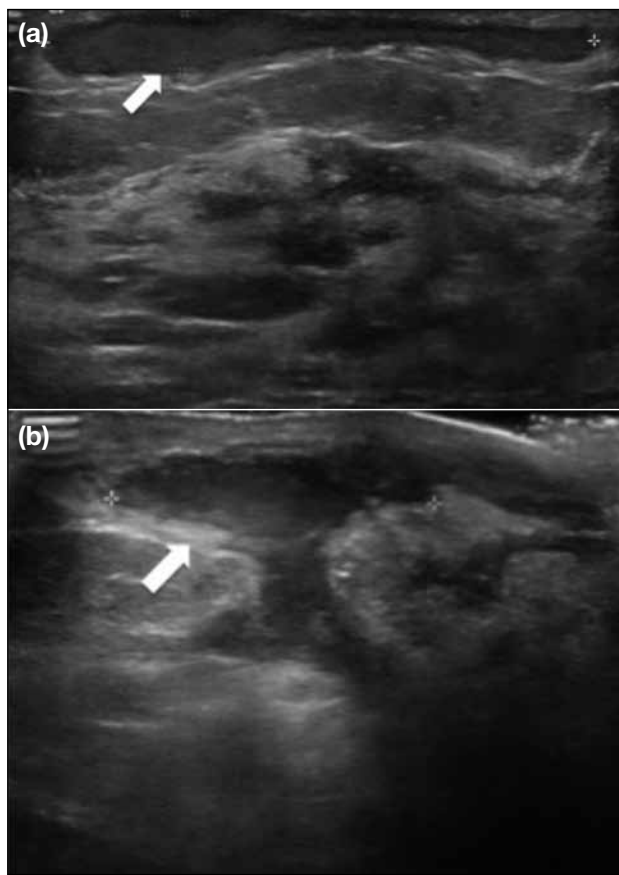
**Figure 1.** A 34-year-old woman who presented with right breast mass. Ultrasound image of the right breast demonstrated a 4.4 cm × 2.3 cm ill-defined irregular heterogeneous hypoechoic mass with tubular extensions.



**Figure 2.** A 32-year-old woman who presented with a left breast lump. Ultrasound image demonstrated a well-circumscribed hypoechoic mass at 9 o'clock of the left breast, 3 cm from nipple. Core biopsy confirmed idiopathic granulomatous mastitis.

distortion with no discrete mass. Increased vascularity was observed in nine of the cases. Associated ultrasound findings included skin thickening (n = 11), axillary lymphadenopathy (n = 4), sinus tract formation (n = 4) (Figure 4) and nipple retraction (n = 2).

Among the 16 mammogram examinations, the most common finding was focal asymmetric density (n = 6). Other findings included irregular masses (n = 4) (Figure 5) and skin thickening (n = 4). Two mammograms were negative.



**Figure 3.** Ultrasound images showing irregular hypoechoic collection in two patients with idiopathic granulomatous mastitis mimicking breast abscess. (a) A 34-year-old woman presented with erythema and mastalgia over the right breast. Ultrasound image shows a collection at 12 o'clock of the right breast, 1 cm from the nipple. Skin thickening was observed. 3 mL of blood stained fluid was aspirated. The patient was initially treated as breast abscess. (b) A 32-year-old woman presented with left mastalgia and skin erythema. Ultrasound image shows a collection (arrow). Aspiration yielded 2 mL of blood-stained fluid and patient was initially treated as having a breast abscess.

### Pathological Diagnosis and Evaluation

In total, 17 FNABs, 24 ultrasound-guided core biopsies, and two surgical biopsies were performed, and were diagnostic in 23.5%, 100% and 100%, respectively.

Microbiological testing was performed on all specimens to exclude infectious causes, including tuberculosis and fungal infection. *Corynebacterium* species were found in four specimens.

### Treatment and Follow-up

Sixteen patients were treated medically with a combination of steroids and antibiotics, three were treated with steroid monotherapy, and five did not receive

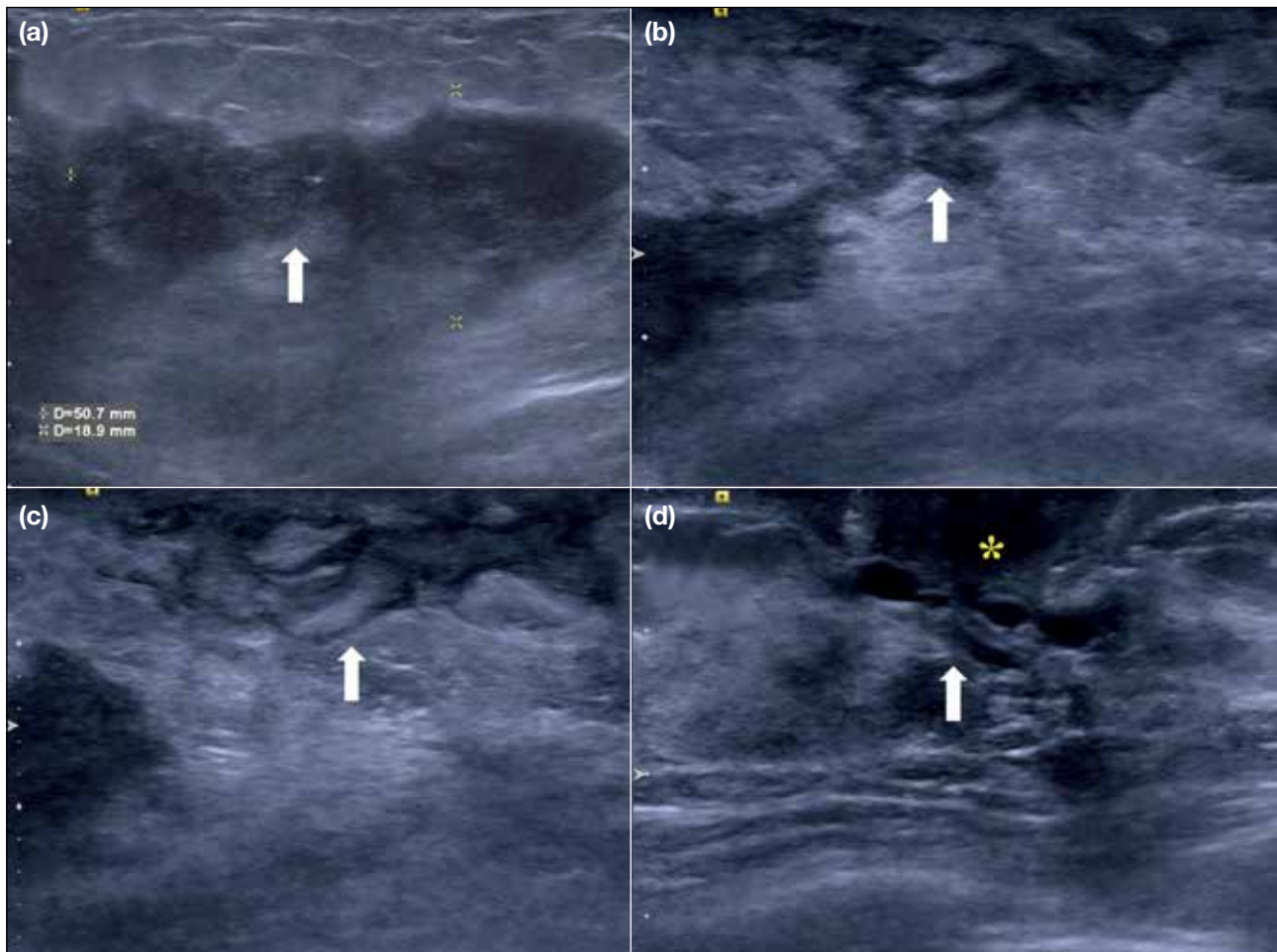
any medical treatment. Drainage was performed in 18 lesions. One lesion was surgically excised. Recurrence developed in 13 patients (44.8%) with a median follow-up of 21 months.

### DISCUSSION

Imaging features of IGM are nonspecific without pathognomonic findings. The most frequently reported ultrasound finding is an irregular hypoechoic mass associated with multiple tubular extensions.<sup>4,6</sup> Fluid collections or abscesses have also been described, with a reported prevalence ranging from 6.6% to 54%.<sup>7</sup> Less commonly described finding was parenchymal distortion without a discrete mass.<sup>2,8</sup> Associated findings such as skin thickening, oedema, axillary adenopathy, and sinus tract formation have also been observed.<sup>2,4,9</sup> In our centre, ultrasound is the first assessment modality for symptomatic patients aged <40 years. It is the preferred modality for assessment of breast masses in young Asian women, since mammography is considered less sensitive than ultrasound in Asian populations, where heterogeneous or extremely dense breast tissue is common.<sup>10</sup> In our institution, ultrasound findings for IGM were likewise nonspecific, with two patients initially diagnosed with breast cancer and 22 patients initially diagnosed and treated as breast abscess.

The commonly reported mammographic findings are focal asymmetry and masses with irregularly shaped or obscured margin.<sup>7</sup> Lee et al<sup>11</sup> reported other associated findings including parenchymal distortion, skin thickening, and axillary lymphadenopathy in 54.5% to 63.7% of patients. In our study, apart from the similarly described features, two out of 16 of the lesions were mammographically occult. This may be due to decreased mammographic sensitivity in dense breasts, or poor mammographic sensitivity in detection of IGM.

Due to the nonspecific radiological findings, biopsy and histology are key to making the diagnosis of IGM. Demonstration of non-caseous granulomatous inflammation is required for definitive diagnosis of IGM. Biopsy techniques include FNAB, core needle biopsy, and surgical biopsy. Because of its ready availability and low risk, FNAB is always performed to exclude infection and malignancy. However, FNAB did not provide sufficient tissue for diagnosis in these cases. Core biopsy obtained sufficient specimens for diagnosis. In our study, only 23.5% of the FNAB specimens were diagnostic, while core biopsy yielded 100% diagnostic quality.

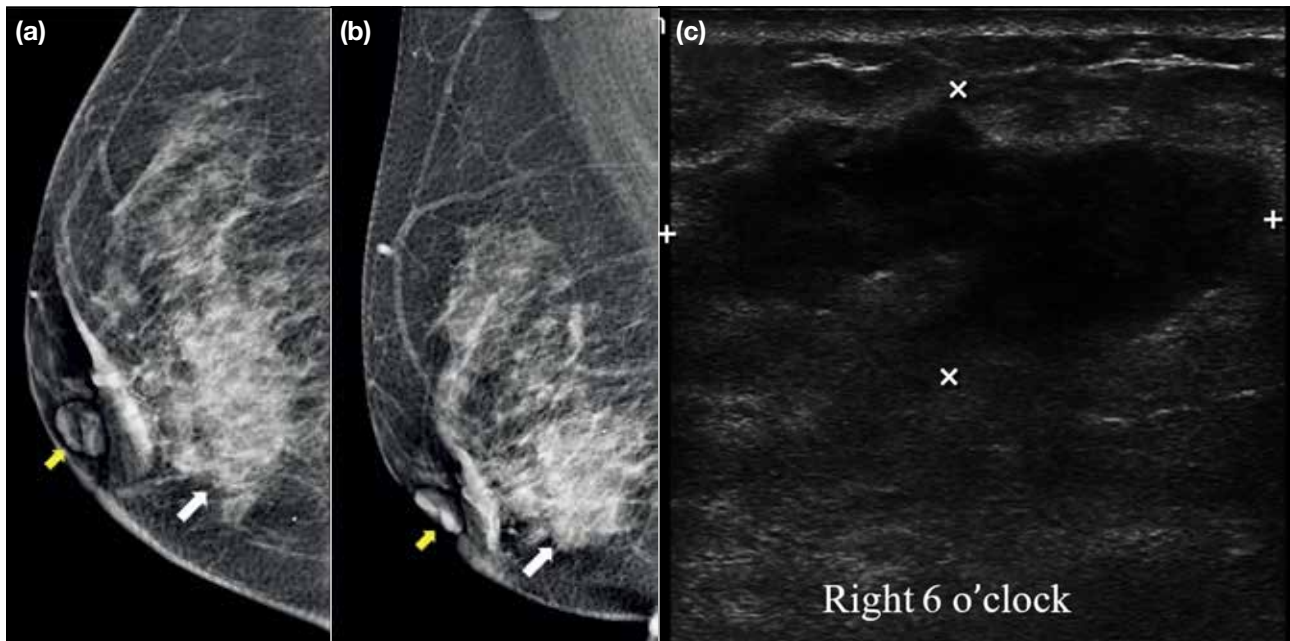


**Figure 4.** A 43-year-old patient confirmed with idiopathic granulomatous mastitis. Ultrasound images showing (a) an irregular hypoechoic area measuring >5 cm, spanning from 2 to 4 o'clock of the left breast (white arrows); (b, c) sinus tract extending from the collection to the subcutaneous layer, and (d) the sinus tract extending to the nipple (yellow asterisk). There was increased echogenicity of the subcutaneous fat and skin thickening consistent with inflammatory changes.

IGM is a rare condition with no well-established aetiology. Association with hyperprolactinaemia had been postulated, in which prolactin-secreting pituitary adenomas and antipsychotic medications were the most common documented causes.<sup>9,12-16</sup> Recently, Co et al<sup>17</sup> proposed *Corynebacterium kroppenstedtii* as a risk factor for IGM; it was associated with a higher rate of disease recurrence. *C kroppenstedtii* is a slow-growing opportunistic organism that rarely causes infection and cannot be isolated using routine culture methods, that often leads to underdiagnosis. Wong et al<sup>18</sup> postulated a possible association between antipsychotic drug-induced hyperprolactinaemia and *C kroppenstedtii*-related mastitis. In our study, nine patients were documented to have hyperprolactinaemia, in which *C kroppenstedtii* was isolated in four of the specimens. However,

prolactin levels are not investigated routinely in our patients diagnosed with IGM and taking antipsychotic medications; so hyperprolactinaemia could be underdiagnosed. In view of possible association between hyperprolactinaemia and *C kroppenstedtii*-related mastitis, prolactin levels and *C kroppenstedtii* should be investigated in patients diagnosed with IGM. Appropriate treatment for hyperprolactinaemia and *C kroppenstedtii* infection could be started as soon as possible to shorten the disease course and decrease recurrence.

As IGM is a rare condition which lacks large cohort studies, and definitive treatment strategies have yet to be established. Conservative approaches such as antibiotics and drainage, steroids and immunomodulatory drugs, as well as surgical excision have been described in the literature.<sup>19-22</sup>



**Figure 5.** A 52-year-old woman who presented with an initial radiological diagnosis of breast malignancy. (a) Craniocaudal view and (b) mediolateral oblique view mammogram of the right breast showing a high-density irregular mass (white arrows) spanning from the retroareolar area to the lower part of the breast. It was associated with skin thickening and nipple retraction (yellow arrows). It was given a BI-RADS (Breast Imaging Reporting and Data System) category 5. (c) Corresponding ultrasound image demonstrated an irregular hypoechoic mass at 6 o'clock, measuring 4.7 cm at its maximum diameter.

Our study has some limitations because all clinical and imaging findings were retrospectively reviewed. First, some clinical data, such as breastfeeding history and use of oral contraceptive, were missing; and investigations including blood prolactin level and microbiological testing were not performed in all patients. Therefore, the role of these possible contributing factors in IGM remains speculative. Second, mammography was not performed in all of our patients. The decision of performing mammography depended on patient age and presentation, clinician preference and referral, ultrasound findings, and operating radiologists' preference. Future multicentre studies with larger sample size are required to clarify the relationship between blood prolactin levels and IGM, and to compare the different imaging findings in patients with IGM with or without *C kroyppenstedtii* infection.

## CONCLUSION

In conclusion, IGM is a rare benign inflammatory breast disease diagnosed by exclusion. It mimics breast abscess or malignancy both clinically and radiologically. There are no pathognomonic ultrasonographic or mammographic findings. Therefore, histopathological confirmation is important in disease diagnosis and

management. Elevated prolactin levels and the presence of *C kroyppenstedtii* are possible risk factors for IGM and should be investigated further.

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