



## Tuberculous mastitis: A review of 32 cases

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### ABSTRACT

**Background:** Breast tuberculosis (TB) is a rare disease, still present in endemic areas. The significance of breast TB is due to its rare occurrence and its resemblance to malignant breast lesions. The objective of this study was to study various clinical presentations and imaging features of different forms of tuberculous mastitis.

**Methods:** A retrospective study was conducted over a 10-year period. Thirty-two consecutive patients diagnosed with tuberculous mastitis were included.

**Results:** There was only one male patient in this series. The patients ranged in age from 25 to 60 years (mean age was 33.69 years). A solitary breast mass was the most common clinical presentation, which was associated with inflammatory findings in the majority of cases. The most common mammographic finding was diffusely increased density and the most common pathological finding was solitary mass. The most common appearance on ultrasound was of multiple intercommunicating breast masses with axillary lymphadenopathy.

**Conclusions:** Breast TB should be considered in the differential diagnosis in the presence of a painful breast mass, discharging sinuses, mastitis, or a breast abscess that does not respond to conventional medical treatment. A multidisciplinary approach is required to aid timely diagnosis and to provide appropriate management and treatment in order to avoid complications.

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### Introduction

Tuberculosis (TB) is a chronic granulomatous disease predominantly caused by *Mycobacterium tuberculosis* and is one of the most widespread human infections in the world. The infection can involve any organ and shows various presentations (Baharoon, 2008). The worldwide increase in rate of HIV infection along with new waves of immigration to developed countries have made TB a new challenge for physicians all over the world. Breast tissue provides resistance to the survival and multiplication of tuberculous bacilli and breast involvement is a rare clinical entity, even in endemic countries (Gon et al., 2013). Tuberculous mastitis (TM) has been called the 'great masquerader' due to its multifaceted presentations (Gon et al., 2013). The non-specific clinical and imaging characteristics and lack of familiarity of clinicians with this entity have led to increased rates of misdiagnosis as breast cancer or pyogenic breast abscess and make it a difficult diagnosis (Madhusudhan and Gamanagatti, 2008). The paucibacillary nature of TM poses even more challenges with regard to the correct

diagnosis and causes the disease to be commonly overlooked (Domingo et al., 1990).

TM can be due to direct inoculation of bacilli through lactiferous ducts, secondary to primary infection elsewhere in the body, or rarely due to direct extension from the chest wall. Tissue involvement in the breast presents with various changes like focal or diffuse changes in breast architecture, solitary or multiple breast masses, abscesses, sinus tracts, skin ulcers, or skin thickening. All of these changes are reflected in mammographic and sonographic examinations. In order to make a correct and timely diagnosis, physicians need to be familiar with these different presentations of TM. In the present study, a retrospective evaluation of 32 patients with TM was performed and the important issues regarding the imaging characteristics of this rare disease are described.

### Materials and methods

In this retrospective and observational study, 32 patients diagnosed with biopsy-proven TM were gathered from the records of the radiology, surgery, and pathology departments of two first-level academic and research hospitals. Over the 10-year period from April 2008 to December 2018, imaging data were obtained for all patients with mammography and/or sonography examinations

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followed by ultrasound-guided core needle biopsy (CNB) or fine needle aspiration cytology (FNA) of breast lesions or abnormal axillary lymph nodes, who had a bacterial or histological analysis in favor of TM. The patients were considered positive for breast TB if records demonstrated a positive culture for acid-fast bacilli, smear positivity on Ziehl–Neelsen staining, positive PCR examination for TB, or cytological and histological findings in favor of TB infection. Since this was a retrospective study, the need for informed consent was waived.

Demographic data (such as age, sex, side of involvement, previous history of TB), clinical presentations, physical examination, and radiological investigations (including mammography and ultrasound) were reviewed. All mammograms and ultrasound examinations were re-evaluated by an experienced radiologist (with more than 10 years of experience in breast imaging). Patients were divided into three TM groups according to their clinical and ultrasound findings, in accordance with the recent classification by [Tewari and Shukla \(2005\)](#): (1) nodular tubercular mastitis, (2) disseminated tubercular mastitis, and (3) tubercular breast abscess. The nodular type consists of slow-growing single or multiple breast masses, with/without associated sinus tracts and/or skin ulcers. The disseminated type consists of diffuse coalescent multiple foci of inflammation and hypo-echoic tissue that are usually associated with sinus tract and/or skin ulcer. Tubercular breast abscess consists of liquefied breast lesions, which may be associated with skin ulcer or sinus tracts.

## Results

### Demographic data and clinical results

The study population comprised 31 female patients and one male patient, who ranged in age from 25 to 60 years (mean age  $33.69 \pm 7.05$  years). The mean duration of symptoms was 6 months (range 2 months to 4 years), with most patients presenting within 4–8 months after the onset of symptoms. Two patients with the sclerosing type of the disease reported a disease duration of more than 3 years. Right-sided involvement was seen in 17 patients (53.1%), while left breast involvement was found in 15 patients (46.9%). There was no case of bilateral involvement in this series.

Clinical examination results including presence/absence of a breast mass (solitary or multiple), skin changes (sinus tracts, ulcers, skin thickening, or skin discoloration), the presence of palpable axillary lymphadenopathy, and nipple retraction were recorded for each patient. The presence of mastalgia, nipple discharge, and constitutional symptoms such as fever, night sweats, or weight loss were also recorded from the patient archives. The most common clinical presentation was breast mass. The most common site of palpable breast masses was the upper outer quadrant of the right breast; the second most common site was the left retro areolar region. The clinical findings are summarized in [Table 1](#).

**Table 1**  
Presenting symptoms of 32 patients with breast tuberculosis.

Symptom	Number (%)
Palpable mass	
Solitary	16 (47.1)
Multiple	12 (35.3)
Sinus tract	10 (29.4)
Skin ulcer	2 (5.9)
Skin thickening or discoloration	7 (20.6)
Nipple discharge	1 (2.9)
Nipple retraction	2 (5.9)
Mastalgia	6 (17.6)
Palpable axillary lymphadenopathy	8 (23.5)
Constitutional symptoms	6 (17.6)

All patients displayed an elevated erythrocyte sedimentation rate (ESR). C-reactive protein (CRP) was tested in 20 patients and was raised in 14 patients. A history of pulmonary TB was found in nine (28.1%) patients.

### Imaging findings

Mammographic images were found in the records of 23 patients. The remaining nine were younger than 30 years old and a mammographic examination was not performed for them. None of the mammographic examinations was normal. Abnormal mammographic findings were categorized as diffusely increased density, focal asymmetry, and solitary or multiple masses. The presence/absence of calcifications, skin thickening, nipple retraction, and lymphadenopathy on mammograms were also evaluated. Mammographic findings are summarized in [Table 2](#).

Ultrasound was performed in all patients. A solitary breast mass was detected in the ultrasound examination of six patients (18.8%). Two patients showed a well-defined, smooth bordered hypoechoic mass, two had a solitary mass with internal cystic changes (abscess), and in two cases ultrasound revealed a mass with irregular and speculated margins mimicking a malignant breast lesion. The most common site of solitary mass was in the upper outer quadrant. Ultrasound revealed multiple intercommunicating hypoechoic or cystic/complex internal echogenicity masses in 11 patients (34.4%) and multiple discrete masses in just one patient (3.1%). Sinus tracts were seen between the breast lesions and skin in 11 patients (34.4%). Fifteen patients (46.9%) showed inflammatory changes in the breast parenchyma, increased echogenicity due to parenchymal edema, dilated sub areolar lactiferous ducts, and increased skin thickness. Inflammatory changes were the only sonographic findings in 11 patients (34.4%) and were associated with solitary or multiple breast masses in four cases (12.5%). Abnormal axillary lymph nodes were detected on ultrasound in 20 patients (62.5%). The ultrasound features regarded as abnormal findings in axillary lymph nodes were the absence of normal central fatty hilum, increased cortical thickness more than 3 mm, and increased short axis diameter more than 15 mm. The most common ultrasound appearance in this series was multiple intercommunicating breast masses with axillary lymphadenopathy, found in 12 patients (37.5%). Ultrasound findings are summarized in [Table 3](#).

In this series, the nodular form was the most common type of TM and was seen in 18 patients. Twelve patients presented with the disseminated form, and the sclerosing form was seen in only two patients with more than 3 years duration of the disease.

A chest X-ray was acquired for all patients after the final diagnosis and suggested pulmonary TB in four patients. Chest computed tomography (CT) was performed in only two patients with extensive breast lesions, to determine whether there was evidence of chest wall involvement; this was negative for chest wall involvement in both cases.

**Table 2**  
Mammography findings in 23 patients with tuberculous mastitis.

Mammographic finding	Number of patients (%)
Diffusely increased density	11 (47.8)
Focal asymmetry	2 (8.7)
Solitary mass	6 (26.1)
Multiple masses	4 (17.4)
Skin thickening	5 (21.7)
Nipple retraction	2 (8.7)
Axillary lymphadenopathy	4 (17.4)

**Table 3**  
Ultrasound findings in 32 patients with tuberculous mastitis.

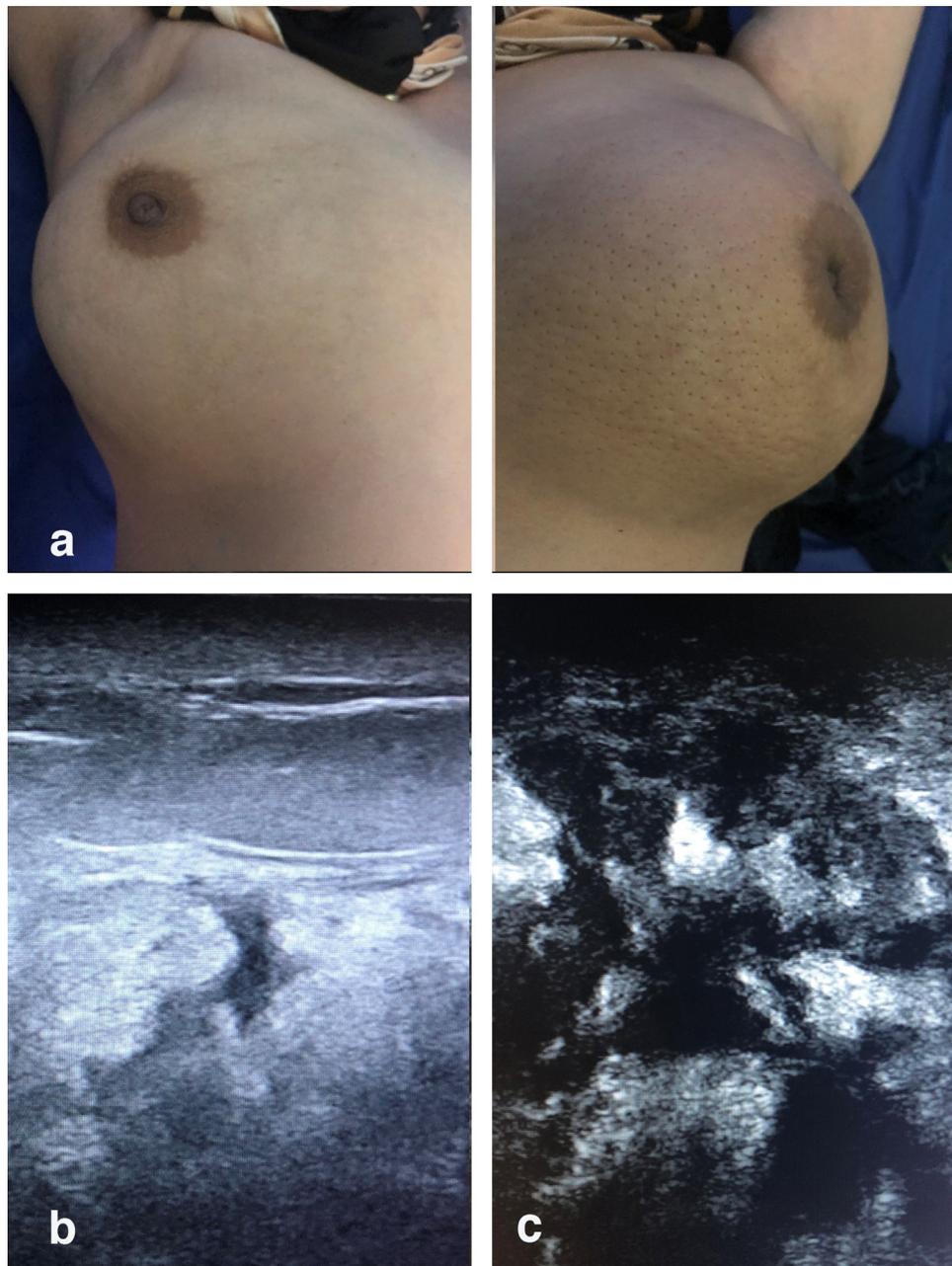
Ultrasound findings	Number (%)
Solitary mass (solid/cystic/complex)	6 (18.8)
Multiple masses (solid/cystic/complex)	12 (37.5)
Inflammatory changes <sup>a</sup> (alone, or associated with other findings)	15 (46.9)
Sinus tract	11 (34.4)
Lymphadenopathy <sup>b</sup> (alone, or associated with other findings)	20 (62.5)

<sup>a</sup> Ultrasound inflammatory changes were defined as echogenicity due to parenchymal edema, dilated sub-areolar lactiferous ducts, and increased skin thickness.

<sup>b</sup> Abnormal lymph node criteria included the absence of normal central fatty hilum, increased cortical thickness more than 3 mm, and increased short axis diameter more than 15 mm.

### Laboratory diagnosis

In patients with a breast abscess, the abscess was aspirated and sent for smear and culture. In cases with solitary or multiple breast masses, or diffuse breast involvement, core needle biopsy was performed and specimens were sent for histological evaluation, tuberculosis culture, and tuberculosis PCR evaluation. An open surgical biopsy was performed in one patient. Among the 32 patients, four had positive smear examinations, 15 had positive tuberculosis culture, and 10 were diagnosed with positive tuberculosis PCR; for three patients, the only diagnostic clue was the presence of granulomas and caseous necrosis in the histological examination.

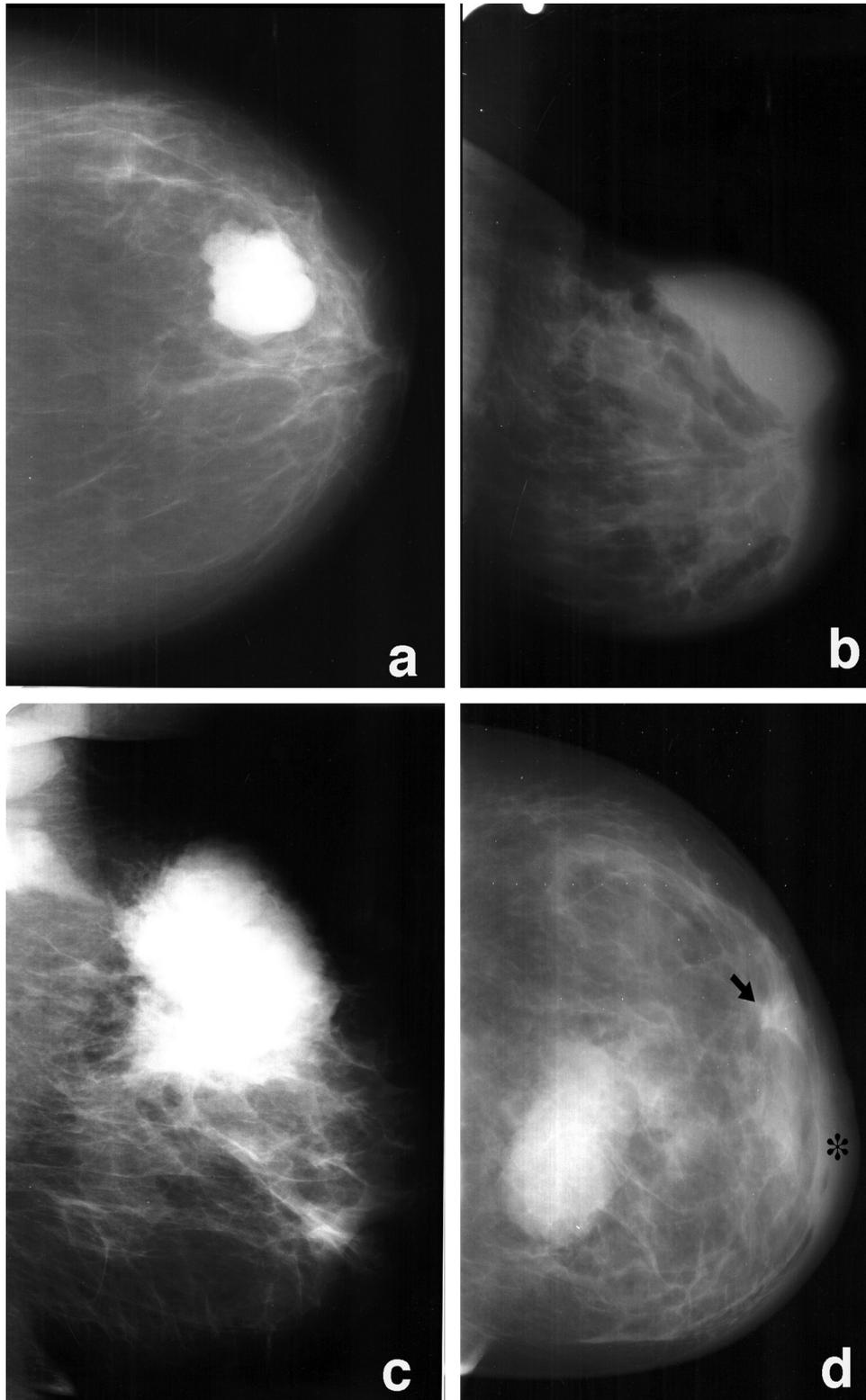


**Figure 1.** Disseminated type of tuberculous mastitis. A 56-year-old female presented with a gradually growing breast mass of 6 months and newly formed inflammatory changes. Nipple retraction, skin thickening, and peau d'orange changes were evident at presentation (a). Ultrasound examination showed inflammatory changes as skin thickening (asterisk in b) and increased parenchymal echotexture. Multiple intercommunicating hypoechoic lesions were also seen in the sub areolar region (c). The patient underwent core needle biopsy and tuberculosis was proven histologically.

## Discussion

This study highlights the common clinical and imaging findings of TM. The mean age of the patients in this study was 33.69 years. Two patients were lactating and two were pregnant at the time of

diagnosis (12.5%). Pregnant or lactating women have constituted 7–33% of patients in other studies (Shinde et al., 1995; Banerjee et al., 1987). It is suggested that TM is more common in the reproductive age, and this has been attributed to the hyper-vascularity of breast tissue and dilated lactiferous ducts in this time



**Figure 2.** Mammographic examinations of four patients with tuberculous mastitis, showing solitary breast masses with a circumscribed well-defined margin (a), a large circumscribed mass with well-defined margins (b), a large mass with irregular margins resembling breast carcinoma (c), and a mass with indistinct margins that was initially suspicious for malignancy (d). Panel d also shows associated nipple retraction (arrow) and skin thickening (asterisk).

period (Inoue et al., 1986). The presence of mental and physiological stress and increased rate of traumatic injury to the breast tissue in childbearing mothers may also have a role in the increased incidence of the disease. The presence of TB in the faucial tonsils of suckling infants is suggested as a potential route of infection in lactating women. Breast TB in men has rarely been reported and men have constituted about 3% of patients in previous studies reporting breast TB (Shinde et al., 1995; Khanna et al., 2002; Harris et al., 2006). In the present series, there was one case (3.12%) of male breast TB.

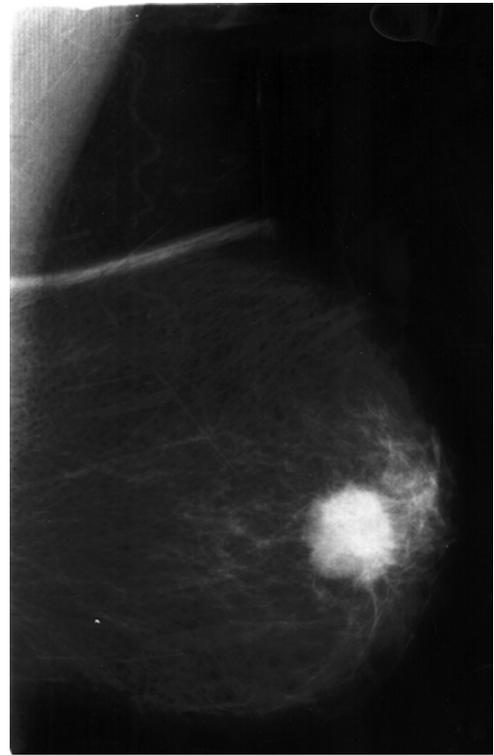
#### Clinical presentations

The most common presenting symptom of TM in this study was a solitary breast mass (47.1% of patients), followed by multiple palpable masses (35.3%). Inflammatory changes like skin discoloration, skin ulcer, sinus tracts, and nipple discharge were frequent associated findings (Figure 1). Although the most commonly reported presentation of TM in the literature is a solitary mass (Baharoon, 2008; Khanna et al., 2002; Mirsaiedi et al., 2007), which is concordant with our results, multiple breast masses have not been as prevalent in previous reports as in the present study (Khanna et al., 2002; da Silva et al., 2009). Multiple breast masses were the second most common presentation in our patients. This may be due to the fact that most patients presenting to our center are referral patients in whom the diagnosis might have been delayed due to the complex nature of the disease. The most common location of the masses was the central and upper outer parts of the breast. This may be due to the frequent extension of tuberculosis from axillary nodes.

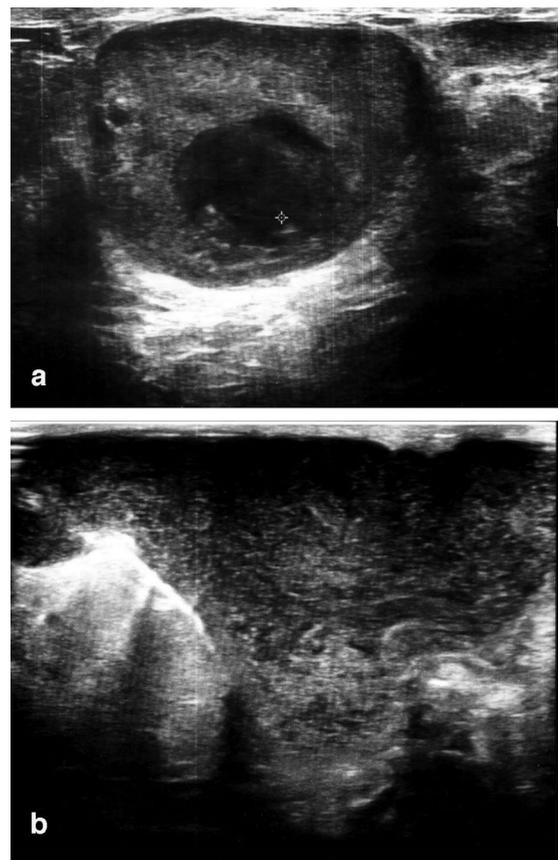
#### Imaging characteristics

The nodular type of TM is the most common type, and usually presents as solitary or multiple well-circumscribed, slowly growing painless masses (Figure 1). These may enlarge (Figure 2) and progress to involve the overlying skin, ulcerate, or form multiple sinus tracts (da Silva et al., 2009; Galego et al., 2019). In the early stages, the masses have well-defined margins mimicking fibroadenoma or other benign breast lesions, while in the later stages they may mimic breast carcinoma (Figure 2) (Madhusudhan and Gamanagatti, 2008; Longman et al., 2017). Histologically, this form is characterized by extensive caseation and little fibrosis. The mammographic features of the nodular type are often dense masses with indistinct margins, without the classic halo sign found in benign breast masses (Figures 2 and 3) (Tewari and Shukla, 2005; Khanna et al., 2002; Longman et al., 2017). The breast mass may demonstrate irregular, speculated margins resembling breast carcinoma (Figure 3) (Madhusudhan and Gamanagatti, 2008; Farrokh et al., 2017; Thimmappa et al., 2015). The healed granuloma may also be evident as calcification on mammography. Ultrasound examination of the nodular type of TM usually reveals well-defined hypochoic masses (Figure 4) (Longman et al., 2017; Sakr et al., 2004). In cases of abscess formation, ultrasound shows a heterogeneous fluid-containing mass or masses that suggest the presence of a complicated cyst, breast abscess, or a necrotic tumor (Figures 4 and 5) (Sakr et al., 2004). In this study, the nodular type of TM was the most frequent type and was seen in 56.2% of patients. Abscess formation was seen in 12 patients.

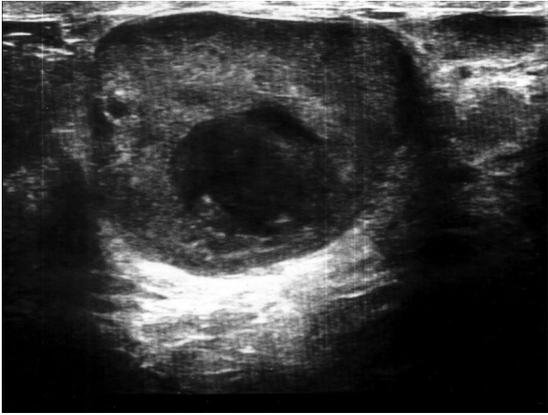
The disseminated or diffuse type is the second most common variety of breast TB that is seen with more virulent organisms or a poor patient immune response. This form usually manifests as multiple foci of infection, which may later caseate and lead to abscess and sinus formation (Figure 6) (Tewari and Shukla, 2005; Khanna et al., 2002; da Silva et al., 2009). The breast may be tender and painful. The overlying skin is often thickened and painful ulcers may develop. Multiple sinuses and skin fistulas are common



**Figure 3.** Mediolateral oblique mammogram of a patient with breast tuberculosis showing a mass with speculated margins.



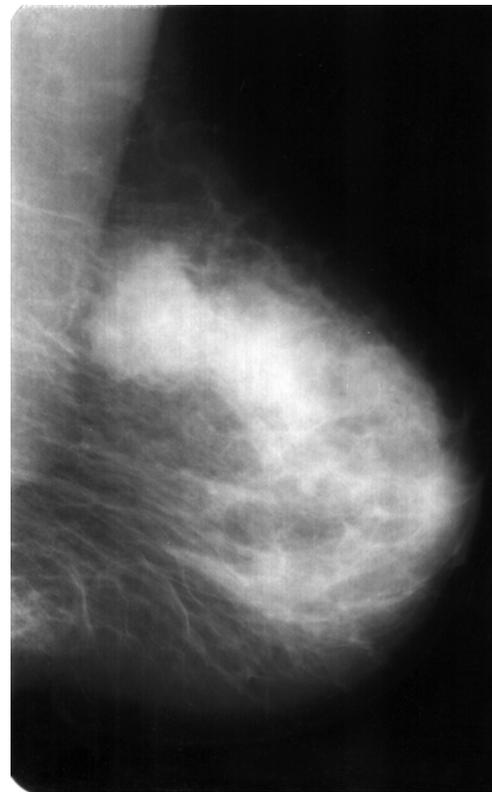
**Figure 4.** Ultrasound examinations in two patients with the nodular type of tuberculous mastitis showing a well-defined hypochoic mass with complex internal echotexture (a) and a large collection with internal debris (b).



**Figure 5.** Ultrasound examination in a patient with breast tuberculosis showing a well-defined cyst with internal debris that represents abscess formation.

findings in the disseminated form (da Silva et al., 2009; Longman et al., 2017). Multiple masses with irregular margins and associated skin thickening are the most common mammographic presentation in this form of breast TB (Figure 7) (Longman et al., 2017; Sakr et al., 2004). This type of breast TB may be accompanied by significant skin and parenchymal edema (Figure 8). In the disseminated form, ultrasound usually demonstrates multiple hypoechoic breast abscesses with irregular margins and posterior acoustic enhancement (Figure 9). Intercommunicating foci of infection evolving into an abscess, associated with peripheral inflammatory reaction and tissue edema are also commonly reported in this form of TM (Figures 1, 6 and 9) (Longman et al., 2017; Sakr et al., 2004). The presence of multiple intercommunicating breast masses with mobile internal echoes on ultrasound is highly suggestive of abscess formation and is a common finding in patients with breast TB and idiopathic granulomatous mastitis (Fazio et al., 2016). This ultrasound appearance can help differentiate breast abscess formation from breast carcinoma (Sakr et al., 2004). The disseminated form of TM is more commonly reported in older women and may be confused with other granulomatous diseases such as idiopathic granulomatous mastitis and breast carcinoma.

In the sclerosing type of TM, extensive fibrosis is a dominant feature, which may lead to secondary retraction and atrophy of the breast (Tewari and Shukla, 2005; Galego et al., 2019). This form is often seen in involuting breasts of older patients and may be mistaken for breast carcinoma (Longman et al., 2017). In sclerosing TM, mammographic features depend on the extent of tissue fibrosis. Mammography may reveal a homogeneous dense mass, usually with an ill-defined margin and irregular borders (Tewari and Shukla, 2005) (Figure 10). Nipple retraction, focal or diffuse skin thickening, coarse stromal texture, and focal or asymmetric breast densities may be seen in the later stages. Asymmetry of the

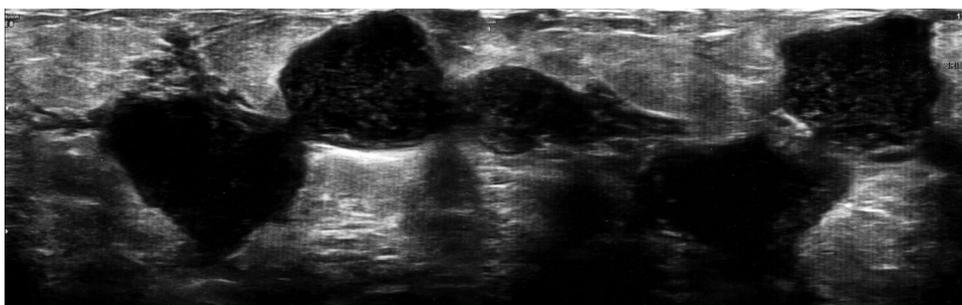


**Figure 7.** Mediolateral oblique mammogram in a patient with breast tuberculosis showing multiple indistinct masses.

two breasts and retraction of the breast volume may occur in these patients, which is a distinguishing feature from malignancy. As the fibrotic reaction progresses, the scar tissue and interlobular edema may obscure an underlying lesion mammographically and so ultrasound is important to evaluate the breast lesions in these cases and can detect breast parenchymal changes and usually reveals heterogeneous echotexture of the breast (Longman et al., 2017).

In recent years most reported cases of TM have been of the nodular form, with the other types rarely reported. In the present study, the nodular form of breast TB was the most common type (56.25%), followed by disseminated (37.55%) and sclerosing forms (6.25%).

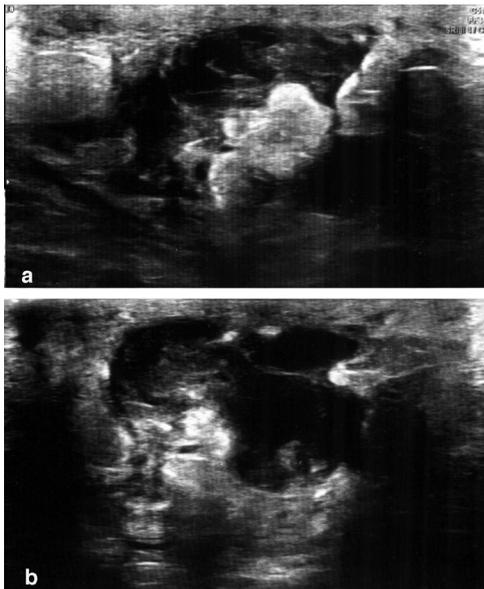
Mammography has limited value in the diagnosis of TM. Ultrasound is a valuable and essential complementary modality to mammography, not only for evaluating the extent of the disease but also for performing an image-guided biopsy and percutaneous abscess drainage (Longman et al., 2017). Ultrasound can detect breast masses masked by the dense, coarse, and heterogeneous stroma at mammography, and assess the axillary



**Figure 6.** Panoramic view of an ultrasound examination in a patient with breast tuberculosis showing multiple intercommunicating abscesses.

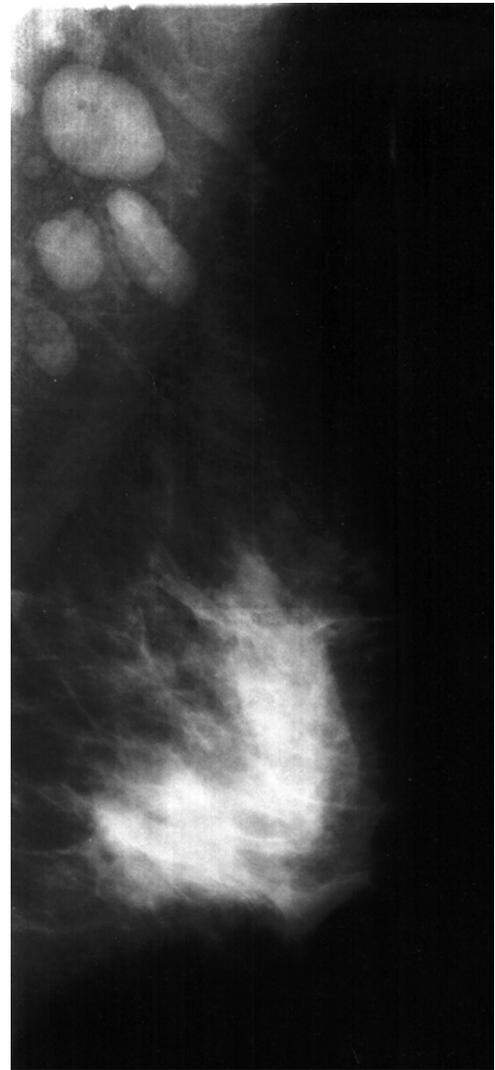


**Figure 8.** Craniocaudal mammogram of a patient with breast tuberculosis showing diffusely increased breast density associated with multiple breast masses and skin thickening.



**Figure 9.** Ultrasound examinations in 32-year-old patient (a) and a 45-year-old patient (b) with breast tuberculosis showing intercommunicating foci of infection evolving into an abscess, associated with a peripheral inflammatory reaction.

lymph nodes (Inoue et al., 1986). It is also very helpful in detecting multiple breast lesions communicating with each other and the presence of fistulas, tracts, and sinuses, which mostly favor the diagnosis of chronic infective disease of the breast, especially breast TB and idiopathic granulomatous mastitis (Longman et al., 2017). In this study, the clinical presentation, mammography, ultrasound, and CNB were the four strategies used to make the diagnosis of breast TB.



**Figure 10.** Mediolateral oblique mammogram of a 63-year-old woman with the sclerosing form of breast tuberculosis showing a homogeneous dense mass with ill-defined margin and irregular borders. There are also multiple axillary lymphadenopathies.

Other imaging investigations like CT and magnetic resonance imaging (MRI) are complementary modalities that reveal the extra-mammary extent of the disease and are helpful for appropriate treatment planning. A tubercular breast abscess may be seen as a non-homogeneous hypodense lesion with smooth margins and enhancing rim on contrast-enhanced CT scan. Chest wall involvement, adjacent fistulous tract with the pleura, or a destructive rib lesion may also be evident. The CT scan also shows concomitant pulmonary lesions and is a valuable tool in demonstrating the extent of the disease, surgical planning, percutaneous drainage, and also in the assessment of the response to treatment (Longman et al., 2017). MRI may demonstrate a breast lesion with smooth or irregular margins and bright signal intensity on T2-weighted images in cases of breast abscess, but the findings are non-specific for breast tuberculous abscess (Longman et al., 2017).

The clinical features and radiological characteristics in breast TB are non-specific and are indistinguishable from breast abscesses and carcinomas in most patients (Madhusudhan and Gamanagatti, 2008). Clinical findings such as constitutional symptoms, mobile breast lumps, multiple sinuses and intact nipple, especially in young multiparous or lactating women, are

predictive but not specific features of TM (Tewari and Shukla, 2005). Indeed, the presence of clinical findings such as nipple retraction, peau d'orange, and palpable axillary lymphadenopathy favor the diagnosis of breast carcinoma (Tewari and Shukla, 2005). In advanced stages of breast TB, mammography is not of much help in distinguishing carcinoma from TM, as the mammography findings are usually similar in carcinoma and breast TB (Longman et al., 2017). Ultrasound is usually more helpful, and the presence of multiple intercommunicating breast abscesses, sinus tract formation, and multifocal breast lesions favor the diagnosis of TM rather than a malignant lesion (Longman et al., 2017; Sakr et al., 2004). It is important to be aware that breast carcinoma and TM may occasionally coexist. Farrokh et al. reported a case of coexistence of breast carcinoma and TM in one breast. Tulasi et al. have reported a case of infiltrating ductal carcinoma of the breast and metastasis to the axillary lymph node with evidence of tubercular granuloma in the same lymph node (Tulasi et al., 2006). It is important to remember that the recognition of TB does not exclude the presence of concomitant breast carcinoma (Pujani et al., 2015) and this coexistence causes serious problems regarding diagnosis and treatment (Farrokh et al., 2017; Pujani et al., 2015).

## Conclusions

TM is an uncommon disease even in countries with a high incidence of pulmonary and extrapulmonary TB. The diagnosis of breast TB usually remains obscure and a multidisciplinary team approach is needed to establish a timely and correct diagnosis. Radiological characteristics are non-specific and can be confused with carcinoma, pyogenic breast abscess, and also chronic mastitis, especially idiopathic granulomatous mastitis. Ultrasound is a valuable modality to detect breast lesions and ultrasound-guided core biopsy is recommended as the first-line investigation establishing or excluding the diagnosis of TM. We suggest breast TB as an important differential diagnosis in patients presenting with palpable breast masses in endemic areas, especially if they are accompanied by associated findings such as sinus tracts and skin ulcers.

## Funding source

None.

## Ethical approval

Since this was a retrospective study, no informed consent was required. All images are anonymized.

## Conflict of interest

The authors declare no conflicts of interest.

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