

# The Surgical Management of Granulomatous Mastitis

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**Abstract:** Granulomatous mastitis is an inflammatory breast condition of unknown etiology. Management remains controversial and treatment algorithms are lacking from the literature. Few resources exist that discuss breast reconstruction following extirpation. This descriptive case series reviews the clinicopathologic features of granulomatous mastitis.

We describe the surgical management undertaken at our institution including General and Plastic Surgery procedures. Eleven clinical charts and histologic slides of biopsy specimens were reviewed in our health region between 1992 and 2007. Demographic data, clinical presentation, and radiologic findings were tabulated. Treatment consisted of empirical antibiotics and surgical excision. Procedures performed included incision and drainage (n = 8), excisional biopsy (n = 15), partial mastectomy (n = 5), partial mastectomy with reduction mammoplasty (n = 2), and mastectomy with TRAM flap reconstruction (n = 1).

Treatment was successful in all but one case. Multiple surgeries for recurrent lesions were often required to achieve final remission. Following extirpation, we recommend delayed breast reconstruction to monitor for recurrence.

**Key Words:** granulomatous mastitis, inflammatory breast, surgery, treatment, breast reconstruction

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Granulomatous mastitis (GLM) was first described by Kessler and Wolloch in 1972.<sup>1</sup> It is a rare inflammatory condition of the breast that usually presents in young parous women with a history of breast-feeding.<sup>1–6</sup> Patients frequently present with a tender, erythematous breast mass suggestive of an abscess, and chronic draining sinuses are common.<sup>7–9</sup> The clinical and radiologic features of this benign condition may simulate malignancy.<sup>1,4,6</sup> GLM is infrequently self-limiting and is typically a chronic condition with a tendency for recurrence in the absence of appropriate treatment.<sup>10,11</sup>

GLM is considered an idiopathic condition, but several etiologies have been postulated. These include hypersensitivity to extravasated lactational product, local breast trauma, subclinical infection, and autoimmune processes.<sup>12</sup> Going et al have suggested that there is an association with mammary duct ectasia<sup>4</sup> Taylor et al demonstrated a possible association with *Corynebacteria* infection and discussed the potential role of demographic features such as ethnicity.<sup>12</sup>

Definitive diagnosis is based on histologic examination of excisional biopsy samples. Fine-needle aspirate cytology often reveals an abundance of epithelioid histiocytes and a predominantly neutrophilic background.<sup>5,8,10,13</sup> Histopathology often reveals non-caseating granuloma formation within the breast parenchyma that is centered on breast lobules.<sup>8,14</sup> Neutrophilic microabscesses are often present.<sup>9,12,15</sup> Other causes of mammary granuloma formation must be excluded prior to diagnosis, including sarcoidosis, Wegener's granulomatosis, tuberculosis, and fungal infection.<sup>13,16</sup> Microbiological investigation is therefore a necessity.

There is no formal consensus regarding the appropriate treatment modality in patients diagnosed with GLM. Surgery, steroids, and antibiotics have been attempted with varying degrees of success.<sup>16,17</sup> Recurrence is a common problem and without surgical treatment, patients may undergo a chronic progressive clinical course.<sup>18</sup> Long-term follow-up is essential.<sup>19</sup>

This study represents the largest case series in the surgical literature to describe Plastic Surgical involvement to achieve breast symmetry following the surgical management of GLM. The clinicopathologic features and management of 11 patients identified over a 15-year period are presented.

## MATERIALS AND METHODS

Ethics approval was obtained from the University of British Columbia Clinical Research Ethics Board. Using the Vancouver Hospital Health Sciences Centre electronic laboratory archive, a search was conducted for all histologic breast specimens of women treated at 1 of the 3 tertiary care centers in the Vancouver Coastal Health Authority. Specimens that were consistent with GLM were identified using the search terms "granulomatous" and "mastitis."

Twenty patients were identified within the study period from May 1992 to May 2007. Five clinical records were inaccessible. Four patients were excluded because the histopathology specimens were inconsistent with GLM as determined by the pathologist upon secondary examination of the slides. The remaining 11 clinical records were reviewed retrospectively and the following data were collected: patient demographics, pertinent patient history and clinical presentation. Radiographic, histologic, and microbiological results were also compiled. Finally, treatment modalities and patient outcome were summarized.

## RESULTS

### Clinical Characteristics

Patient demographic features are shown in Table 1. The mean age at time of presentation was 37.4 (SD, 7.2; range, 23–49 years). Ethnicity was diverse. Two patients were pregnant at the time of presentation, 5 patients were pregnant within 6 years prior to presentation, and 2 patients were pregnant at an unknown time interval prior to presentation, for a total of 9 patients (81.8%) with a confirmed history of pregnancy. Two patients had a history of oral contraceptive pill (OCP) use. One patient had a history of remote breast trauma involving a nipple piercing 8 months prior to presentation. No patient had a history of connective tissue disease, sarcoidosis, tuberculosis, or other infectious granulomatous diseases.

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TABLE 1. Demographic Features of Patients With GLM

Patient	Age (yr)	Ethnicity	Gravidity	OCP* Use	Breast Trauma
1	37	Iranian	2	No	No
2	23	White	2	No	No
3	36	Asian	1	No	No
4	43	White	1	No	No
5	38	White	2	Yes	No
6	43	White	3	No	No
7	33	Asian	1	No	No
8	36	White	3	No	No
9	30	White	0	Yes	Yes
10	43	White	Unknown	No	No
11	49	Asian	3	No	No

\*OCP indicates oral contraceptive pill.

No patient had a history of breast cancer in a first-degree relative. The mean clinical follow-up was 18.6 months (SD, 22.7).

The most common presenting symptoms were a solitary breast mass (n = 8, 72.7%), breast pain (n = 6, 54.5%), and overlying skin erythema (n = 6, 54.5%) (Fig. 1, Table 2). One patient had an inverted nipple on the affected side at the time of presentation and another patient developed an inverted nipple during disease progression. The left breast was initially involved in 7 cases (63.6%). The right breast was initially involved in 3 cases (27.2%). One patient presented with bilateral breast involvement. Four patients (36.3%) developed draining sinuses, including 1 patient with at least 10 sinus tracts. One example of a patient with draining sinuses is shown in Figure 2. Only 1 patient had documented axillary lymphadenopathy. Erythema nodosum was noted at the time of presentation in 1 patient. Two patients developed erythema nodosum shortly after presentation.

Radiologic Evaluation

Of 11 patients, 9 underwent radiographic examination (Table 3). Seven patients had both ultrasonography (US) and mammography (MMG) (77.8%). One patient had US alone and another patient had MMG alone. Significant findings were present in 5 of the US scans (62.5%). Three of the US scans showed no discrete mass but demonstrated ill-defined, irregularly shaped areas of mixed echogenicity, which were consistent with contusion or mastitis. Two of the US scans revealed an ill-defined inhomogeneous mass, one of which demonstrated flow on Doppler imaging (Fig. 3). The remaining 3 US scans were unremarkable.

Four of the MMG scans (50%) demonstrated areas of non-specific increased density, but no discrete masses or suspicious calcifications were seen. One of the MMG scans revealed a new solid mass with spiculations and poorly defined margins (Fig. 4). This mass was suspicious for breast carcinoma and the patient subsequently underwent an excisional biopsy. Two mammograms showed severe architectural distortion. In one of these cases, it was difficult to distinguish postsurgical changes from malignant architectural disturbance. One MMG study was unremarkable.

Diagnostic and Histopathologic Evaluation

Fine-needle aspiration (FNA) cytology was performed in 9 of 11 patients (81.8%). The cytology reports for 3 of these patients were unavailable. In the remaining 6 patients, the aspirated material was highly cellular consisting mainly of neutrophils and histiocytes with occasional benign ductal epithelial cells. Multinucleated giant



FIGURE 1. Photographs of GLM in a 36-year-old woman with a history of pregnancy. This patient presented with a breast mass, breast pain, and overlying erythema. She also developed multiple draining sinuses. At the time these photographs were taken she had undergone treatment with antibiotics, antituberculosis medications, an incision and drainage procedure, and 2 breast biopsies. Top, Frontal view of both breasts. Bottom, Close-up of left breast affected by GLM.

cells characteristic of granulomatous inflammation were also seen in 2 of the samples.

Excisional biopsy was performed in all 11 patients. Biopsy samples were consistent with GLM according to the original pathology reports. Four samples were not reviewed secondarily as the



TABLE 2. Clinical Presentation of Patients With GLM

Patient	Initial Presentation	Side	Draining Sinuses	Erythema Nodosum
1	Abscess	Right	Yes	Yes
2	Mass, pain, erythema	Left*	Yes	No
3	Mass, pain, erythema	Left	Yes	Yes
4	Pain, erythema	Left	Yes	No
5	Mass, pain, erythema	Left	No	No
6	Mass, erythema	Right	No	No
7	Mass	Left	No	No
8	Mass, pain	Left	No	Yes
9	Mass, pain	Left	No	No
10	Abscess	Right	No	No
11	Mass, erythema	Bilateral	No	No

\*This patient had recurrence bilaterally.

specimens were not accessible. The remaining 7 histologic samples were secondarily reviewed by a pathologist, which confirmed the presence of the characteristic features of GLM in all cases. Lobulocentric granulomatous inflammation was seen with varying degrees of acute and chronic inflammation (Fig. 5). Sinus tracts and stellate microabscesses were also present in many cases. All specimens were negative for malignancy.

Breast samples for all cases were negative for Mycobacteria via staining or culture. Breast aspirate cultures for 2 patients were positive for Corynebacteria species. In another patient, culture results were positive for a coagulase-negative *Staphylococcus* species. An additional culture result showed scant growth of *Staphylococcus lugdunensis*.

Treatment and Outcome

With the exception of one patient, all patients received antibiotics during the course of their treatment for either presumed local infection at the time of presentation or preoperatively. The type, dosage, and duration of antibiotic treatment were variable and depended on patient presentation, culture results, and physician preference. Two patients also received antituberculosis medications despite negative Mycobacteria cultures. The first received a 9-month course, whereas the second discontinued treatment after 2 weeks due to absence of clinical improvement. Three patients also received prednisone steroid treatment. When the dosing regimen was documented, steroids were administered as a short course of 50 mg or less for 7 days followed by a tapering schedule.

All patients underwent surgical management. Of 11 patients, 8 (72.7%) had recurrence and therefore required more than 1 surgical procedure for disease control (Table 4). Surgical procedures

TABLE 3. Ultrasonographic, Mammographic, and Microbiologic Findings of Patients With GLM

Patient	Ultrasonography	Mammography	Microbiology*
1	Normal	Architectural distortion	Coagulase negative <i>Staphylococcus</i>
2	Parenchymal heterogeneity	No study	Negative
3	No study	No study	Negative
4	Parenchymal heterogeneity	Asymmetric density	Corynebacteria
5	Normal	Asymmetric density	Negative
6	No study	Asymmetric density	Negative
7	Parenchymal heterogeneity	Normal	Negative
8	Normal	Asymmetric density	Negative
9	No study	No study	<i>Staphylococcus lugdunensis</i> (scant growth)
10	Ill-defined mass	Mass with spiculations	Corynebacteria
11	Ill-defined mass	Architectural distortion	Negative

\*All samples were negative for Mycobacteria. *Staphylococcus aureus* is excluded.

included incision and drainage (I&D) (n = 8), excisional biopsy (n = 15), and partial mastectomy (n = 5). All I&D procedures were associated with recurrence. Of 15 excisional biopsies and of 5 partial mastectomies, 10 (67.7%) and 2 (40.0%) were associated with recurrence, respectively. The total number of surgical procedures required per patient ranged from 1 to 6 (mean, 2.8; SD, 1.6). The time to recurrence prior to final surgical treatment ranged from 1 to 5 months (mean, 3.1; SD, 1.6).

The final surgical treatment for each patient is shown in Table 4. Three patients underwent Plastic Surgical procedures. The first underwent a right total mastectomy followed by a right transverse rectus abdominis musculocutaneous flap and a left reduction mammoplasty (Figs. 6, 7). The second patient underwent bilateral partial mastectomies using vertical reduction mammoplasty incisions. Recurrence is suspected in this patient in whom a new fistula has developed on the right and a recurrent mass on the left. This occurred 6 months following the breast reconstruction and she is now undergoing steroid treatment. The final patient underwent a left

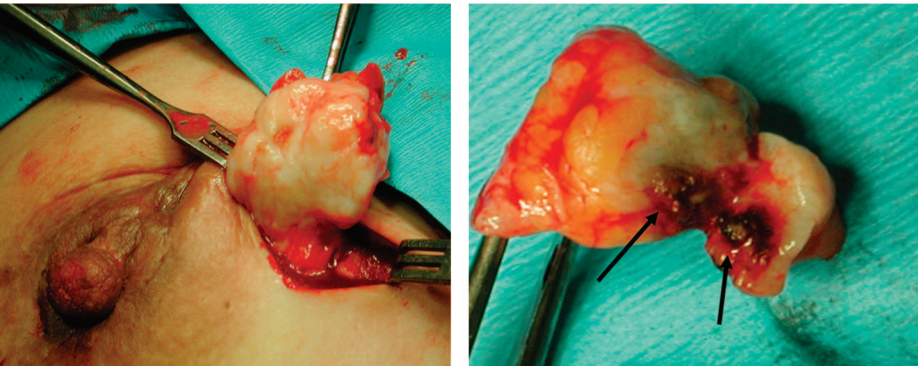
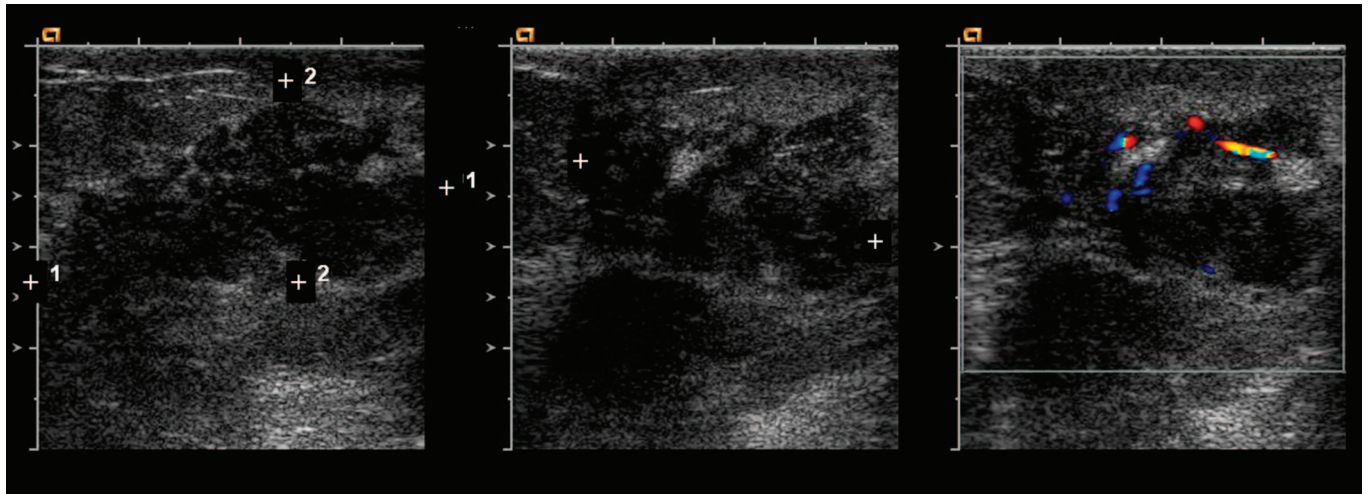
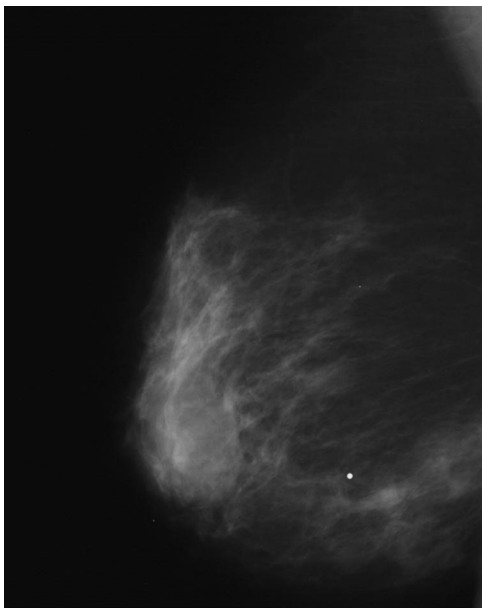


FIGURE 2. Left, A patient with GLM undergoing a left breast biopsy of a breast lump. Right, One of the many chronic draining sinus tracts that developed in this patient (arrows).



**FIGURE 3.** Ultrasonography of the right breast of a patient with GLM revealed an ill-defined mixed density mass with shadowing in the retroareolar region. The findings corresponded to the clinically palpable lump. Left, Transverse retroareolar view. Caliper distance 1 = 4.23 cm. Caliper distance 2 = 1.88 cm. Center, Sagittal retroareolar view. Caliper distance = 3.05 cm. Right, Sagittal retroareolar view. The mass demonstrated flow on power Doppler imaging.



**FIGURE 4.** Mammography of the right breast of a patient with GLM revealed a new retroareolar mass. The mass was estimated at 3 cm in diameter and was suspicious for breast carcinoma. Spiculations were present and margins were poorly defined. The corresponding ultrasound findings are shown in Figure 3.

partial mastectomy in conjunction with a bilateral reduction mammaplasty using the Wise pattern and inferior pedicle (Fig. 8). No other patients developed recurrence following final surgical treatment, for a total recurrence rate of 9.1% (1 of 11 patients).

## DISCUSSION

GLM is a rare benign breast disease.<sup>2,15</sup> Only 11 cases were identified in the Vancouver Coastal Health Authority during the 15-year study period. This condition is reported to occur most frequently in

young parous women.<sup>1–5</sup> All women identified in this case series were of child-bearing age and 9 had a history of pregnancy. The mean age in this study was 37.4 (SD, 7.2). However, female cases ranging from 16 to 83 years of age have been reported.<sup>20–22</sup> Ethnicity in this series was diverse and no trend was observed.

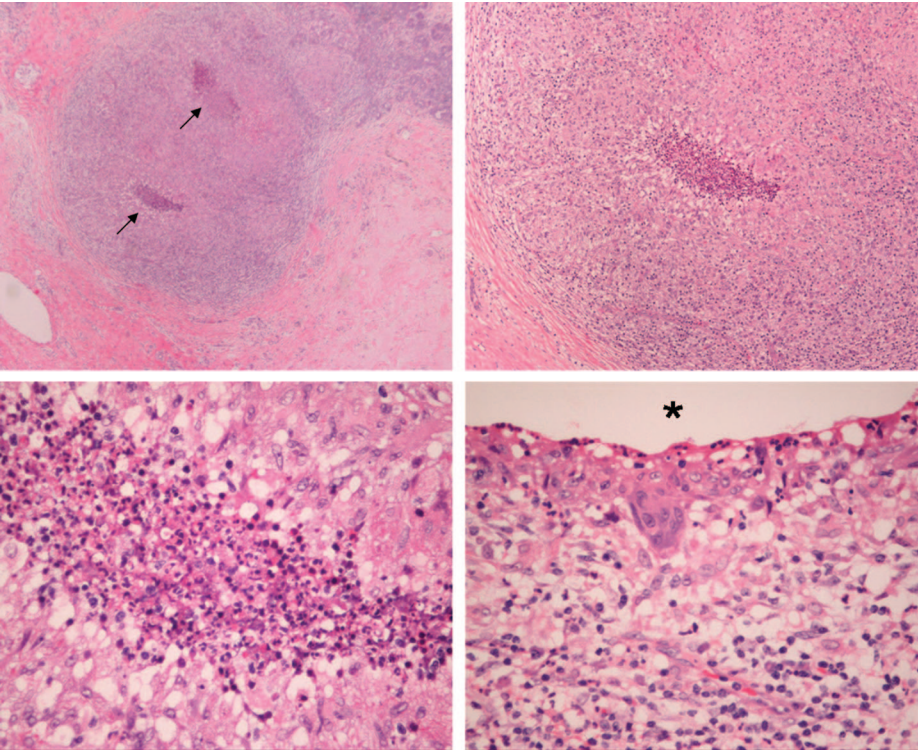
GLM may manifest in several ways, including a solitary breast mass, chronic draining sinus tracts or an abscess cavity.<sup>6,7,16</sup> In this study, patients presented most commonly with a palpable breast mass, breast pain, and overlying erythema. Several patients progressed to form draining sinuses. GLM is usually unilateral, although bilateral involvement has been reported.<sup>2,10,22,23</sup> All patients in this study had unilateral involvement at initial presentation with the exception of one patient.

The diagnosis of GLM is challenging. When a patient presents with symptoms consistent with GLM, the differential diagnosis must include other granulomatous diseases such as tuberculosis, sarcoidosis and Wegener's granulomatosis.<sup>13,16</sup> An autoimmune etiology has been speculated because there is pathologic similarity between GLM and autoimmune conditions such as granulomatous thyroiditis, granulomatous prostatitis, and granulomatous orchitis.<sup>2,16</sup> The association of GLM with erythema nodosum also supports an autoimmune etiology.<sup>12,23,24</sup> Erythema nodosum occurred as an extramammary manifestation of GLM in 3 of the patients in this study. The positive response to steroid treatment has also been noted by some authors and is in keeping with this hypothesis.<sup>8,16,22</sup>

Local immune-mediated inflammation has been proposed as a possible cause of GLM. Extravasated lactational secretions may elicit a local granulomatous response with lymphocyte and macrophage migration. Extravasation of luminal secretions may occur secondary to local trauma or infection causing damage to ductal epithelium.<sup>2,20,23,25</sup> In this study, breast trauma was present in one patient but the traumatic episode was remote. A chemical-induced reaction associated with OCPs has also been suggested<sup>5,17</sup> but there are numerous studies that refute an association with OCPs.<sup>2,10,11,20</sup> Only 2 of the patients in this study were taking these medications.

Infectious etiologies have also been proposed.<sup>12</sup> All samples in this study were negative for Mycobacteria via staining or culture, but 2 samples were culture positive for *Corynebacterium* species. Interestingly, Taylor et al reported an association between GLM and





**FIGURE 5.** Photomicrographs of breast tissue of a patient with GLM. Sections are stained with hematoxylin and eosin. Top Left, Low power. Destruction of breast parenchyma with granulomatous inflammation centered on breast lobules. Microabscesses are discernible in the center of the granulomas (arrows). Top Right, Medium power. Granuloma with central microabscess ringed by epithelioid macrophages, lymphocytes and plasma cells. Bottom Left, High power. Central microabscess with adjacent epithelioid macrophages. Bottom Right, High power. Granuloma with multinucleate giant cells lining previous central microabscess (asterisk).

**TABLE 4.** Surgical Management of GLM

Patient	Surgical Procedures Performed Prior to Final Surgical Treatment	Recurrence	Time to Recurrence (mo)	Final Surgical Treatment	Recurrence After Final Surgical Treatment	Total No. Surgical Procedures
1	I&D (3), excisional biopsy, partial mastectomy	Yes	5	Right total mastectomy reconstructed with pedicled TRAM flap	No	6
2	Partial mastectomy	Yes	1	Bilateral partial mastectomies using the vertical reduction skin incision	Yes	2
3	I&D, excisional biopsy (2)	Yes	3	Partial mastectomy	No	4
4	I&D, excisional biopsy (3)	Yes	5	Left partial mastectomy in conjunction with Wise pattern reduction mammoplasty	No	5
5	Excisional biopsy	Yes	5	Excisional biopsy	No	2
6	None	N/A	N/A	Excisional biopsy	No	1
7	None	N/A	N/A	Excisional biopsy	No	1
8	I&D, excisional biopsy (2)	Yes	3	Partial mastectomy	No	4
9	None	N/A	N/A	Partial mastectomy	No	1
10	I&D, excisional biopsy	Yes	1	Excisional biopsy	No	3
11	I&D	Yes	2	Excisional biopsy	No	2

*Corynebacterium* species infection, particularly infection by *C. kroppenstedtii*.<sup>12</sup>

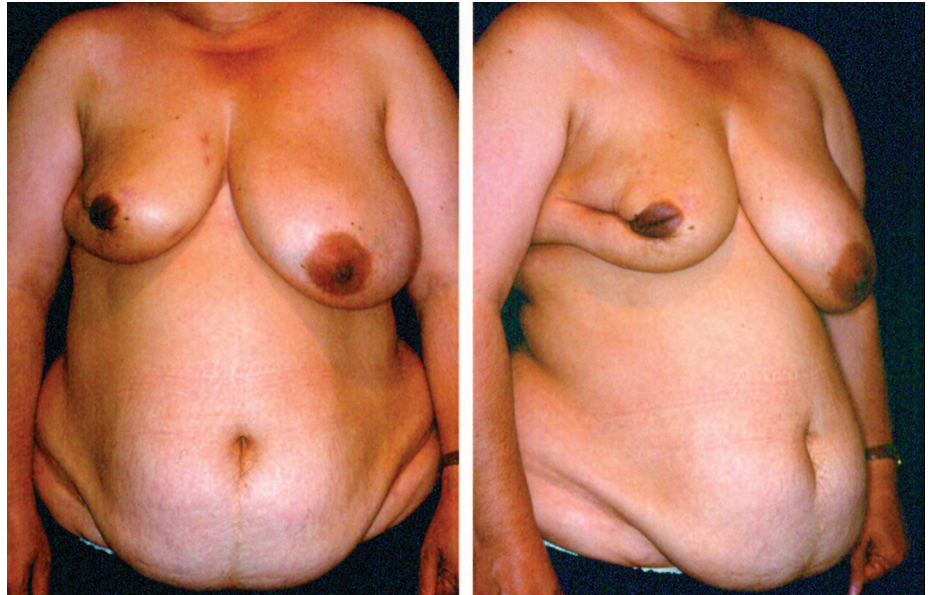
Breast US and MMG are used primarily to rule out malignancy.<sup>17</sup> In this review, the MMG reports of 3 patients were suspicious for breast carcinoma while the majority of the MMG scans with findings revealed focal nonspecific, asymmetric densities. The majority of the US evaluations revealed ill-defined, irregularly shaped areas of echogenicity. These findings are in keeping with previous reports in the literature.<sup>2,6,14,17,25</sup>

Tse et al found that the most common cytologic features of GLM on FNA were the presence of epithelioid histiocytes upon a predominantly neutrophilic background. Multinucleated giant cells

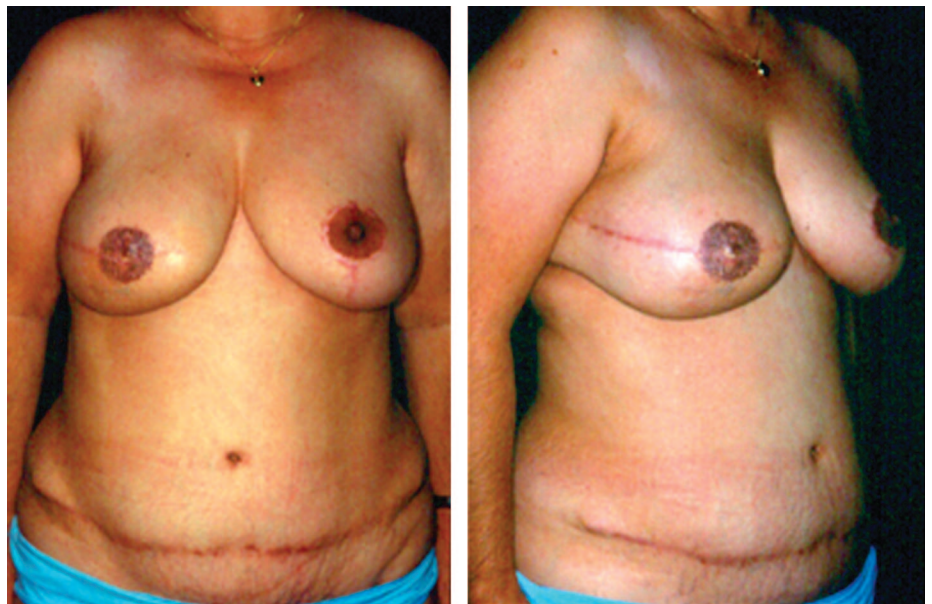
and granulomas may be seen less frequently.<sup>13</sup> Our findings were consistent with this. Excisional biopsy specimens in this study revealed multinucleated giant cells, granuloma formation and microabscesses in a lobulocentric distribution. These are characteristic histologic features of GLM.<sup>20,26</sup>

The optimal management of GLM remains controversial.<sup>15,16,20</sup> In this study, surgical excision and antibiotics were the primary treatment modalities. Steroids were used in 3 patients, as first described by DeHertogh et al<sup>27</sup> One patient's symptoms worsened and coagulase-negative *Staphylococcus* species was subsequently identified on culture. In another patient, steroids were not associated with worsening of symptoms, but did not prevent the

**FIGURE 6.** Photographs of a patient with GLM of the right breast. The patient initially presented with a right breast abscess. At the time these photographs were taken, she had undergone treatment with antibiotics, steroids, antituberculosis medications, 3 incision and drainage procedures, an excisional biopsy and a right partial mastectomy. Left, Frontal view. The patient has a distorted right breast with an inverted nipple and loss of half of the breast tissue. Right, Right lateral view. A small amount of drainage is present through the lateral incision and the nipple areola complex is tethered laterally with inversion of the scar.



**FIGURE 7.** Postoperative photographs of the patient in Figure 6 following a right mastectomy with TRAM flap reconstruction and a left reduction mammoplasty. Left, Frontal view. Right, Right lateral view.



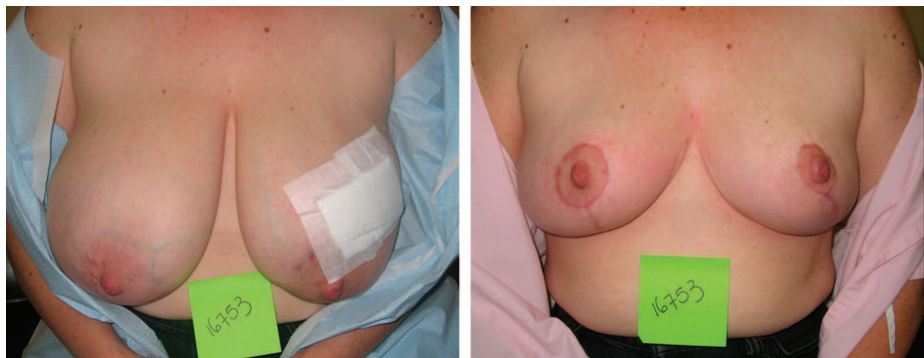
need for definitive surgical management. Many authors recommend steroids only in recurrent disease or following failed antibiotic treatment for presumed infection.<sup>8,11,12,17</sup> Side effects of steroids including glucose intolerance and Cushingoid features must also be taken into account, and the risk-benefit ratio for each patient should be assessed individually.

There is limited data on the use of antibiotic therapy for the treatment of GLM in the literature.<sup>2</sup> However, many patients develop cellulitis, abscesses, and open draining sinuses. Therefore, in these cases we recommend initial empiric treatment with antibiotics for 2 weeks.<sup>8,11</sup> Cultures of all aspirate and biopsy samples should be obtained and can appropriately direct antimicrobial therapy. In the absence of positive acid-fast smears, positive cultures for *Mycobacteria* or histopathologic evidence of tuberculous infection, antituberculous medications are not recommended. However, in endemic areas, the possibility of subclinical tuberculosis infection

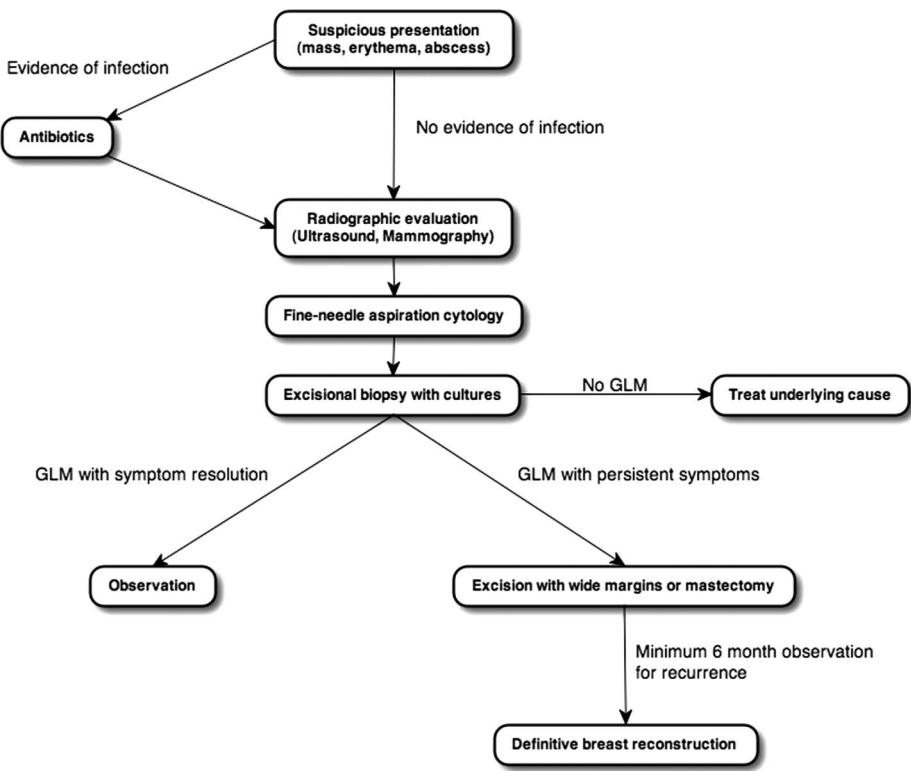
should be considered and further evaluation with more sensitive molecular assays are appropriate.<sup>18</sup>

Limited surgical excisions may lead to recurrence.<sup>17</sup> Wide surgical excisions have been associated with lower complication rates.<sup>2</sup> In this study, incision and drainage was not successful in preventing recurrence. Excisional biopsy was only successful 5 of the 15 times it was performed (33.3% success rate). However, 2 of these 5 cases were repeat excisional biopsies. Simple partial mastectomy failed in 3 of 7 cases (57.1% success rate) and 2 of these failures occurred in the same patient. Total mastectomy was performed in one patient in whom there was no evidence of recurrence. Wilson et al similarly described 3 patients who underwent total mastectomy for GLM without recurrence.<sup>8</sup> Therefore, wider excisions may be associated with lower rates of recurrence and one can postulate that this is attributable to complete excision of residual involved tissue.<sup>12,20</sup>





**FIGURE 8.** Photographs of a patient with GLM of the left breast who initially presented with pain and erythema. Left, At the time of this photograph, she had undergone treatment with antibiotics, steroids, an incision and drainage procedure, and multiple breast biopsies. Underneath the bandage, the patient had a dense area of residual inflamed breast tissue above the nipple areola complex, encompassing one-third of the breast volume. Right, Postoperative photograph following a left partial mastectomy and bilateral reduction mammoplasty using the Wise pattern and inferior pedicle. The “T” on the left is not centered due to excess resection laterally to include all of the granulomatous disease.



**FIGURE 9.** Proposed treatment algorithm for the management of granulomatous mastitis.

Three plastic surgical procedures were performed in conjunction with partial or total mastectomy in this series. The one recurrence occurred in a patient who underwent bilateral partial mastectomies with the vertical reduction skin incision pattern. In this case, it is possible that, despite partial mastectomy, there still may have been inadequate resection margins. This patient may require total mastectomy with breast reconstruction in the future. This highlights the point that, even with large resections, the potential for recurrence remains. In this study, recurrence always occurred within 6 months of the last surgical excision. Therefore, we recommend a delay of subsequent plastic surgical procedures until after this period to allow for monitoring of recurrence rather than proceeding with immediate same-stage procedures. The same is true for the patient with a

lumpectomy who is a candidate for breast conservation. The defect should be closed primarily and the patient reassessed in 6 months for consideration of breast balancing procedures.

A general proposed treatment algorithm is shown in Figure 9. Initial empiric antibiotic therapy is recommended for evidence of infection followed by directed antimicrobial treatment pending culture results. A diagnostic work-up is then completed including radiographic studies, FNA cytology, and excisional biopsy for definitive diagnosis. If the diagnosis of GLM is made and symptoms recur or persist, wide surgical excision or mastectomy is recommended. A delay of at least 6 months is recommended prior to the consideration of plastic surgical procedures for breast asymmetry.

## CONCLUSIONS

GLM is a rare, inflammatory disease of the breast that occurs in young parous women. The disease process most commonly presents as a solitary breast mass. Breast carcinoma and other inflammatory diseases of the breast must be ruled out prior to treatment. Routine radiologic imaging and fine needle aspirate cytology may not be adequate for definitive diagnosis. Histopathologic evaluation via excisional biopsy is recommended in all cases. Wide excision, combined with antibiotics if there is evidence of infection, is the preferred treatment modality. Recurrence is common and therefore delayed breast reconstruction is appropriate to ensure all diseased tissue has been excised prior to definitive treatment.

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