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American Society of Breast Surgeons, Society of Breast Imaging, and College of American Pathology 2025 Guidelines for the Management of Infectious and Inflammatory Lesions of the Breast

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IMPORTANCE The management of infectious and inflammatory lesions of the breast remains controversial. The expert panel focused on management recommendations for 3 of the most common infectious breast conditions, as very few evidence-based guidelines for the management of these conditions exist.

OBSERVATIONS Clinicians should distinguish between infectious and noninfectious lactational mastitis (LM) because the former often requires interventions whereas the latter requires supportive care only. Patients with infectious LM often have thick fluid collections that are not amenable to aspiration and usually require a stab incision with drain placement (but no packing) to resolve the infection. Operative drainage is only required if the patient cannot tolerate an office procedure. If a phlegmon is present, antibiotics should be prescribed for at least 10 days. The diagnosis of granulomatous mastitis (GM) requires pathology confirmation with characteristic findings on core biopsy. Cystic neutrophilic granulomatous mastitis (CNGM) is a specific form of GM associated with a granulomatous reaction to *Corynebacterium* infection and should be empirically treated with doxycycline. For patients without findings characteristic of CNGM and no other associated bacterium identified, there is no role for empiric antibiotic use. Granulomatous mastitis cases often recur and can take up to 18 months to resolve. Patients who have GM cases with worsening symptoms should be treated with repeated intralesional steroid injections; surgical excision or repeated aspirations should be avoided. Cases refractory to intralesional steroid injection may require oral steroids or even advanced biologic agents such as methotrexate or azathioprine. Periductal mastitis with squamous metaplasia of lactiferous ducts (PDM-SMOLD) is a distinct entity from other periductal mastitis cases that can present with recurrent abscesses and should be treated with antibiotics and aspiration for fluid collections. Operative excision for PDM-SMOLD is required for those patients who present with a fistula or recurrent episodes typically using a radial incision to remove the diseased ducts within and below the nipple.

CONCLUSIONS AND RELEVANCE Evidence-informed, consensus-, and expert opinion–based guidelines for the management of infectious and inflammatory conditions of the breast were developed. Clinicians can use these guidelines to appropriately manage these conditions for which clinical care often varied in the past.

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Supplemental content

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This publication represents the second installment of the American Society of Breast Surgeons, Society of Breast Imaging, and College of American Pathology guidelines on the management of benign breast disease and addresses infectious and inflammatory conditions of the breast: lactational mastitis (LM), granulomatous mastitis (GM), and periductal mastitis with squamous metaplasia of lactiferous ducts (PDM-SMOLD). The management of these conditions has significantly changed over the past decade, resulting from a more sophisticated understanding of the natural history of these conditions. Unfortunately, because of space constraints we do not address management of nonlactational mastitis in these guidelines. We prioritized management of LM, GM, and PDM-SMOLD because of the controversial management of these conditions and the lack of existing guidelines on these conditions.

Methods

The American Society of Breast Surgeons convened a steering group to oversee guideline development in collaboration with the Society of Breast Imaging and College of American Pathology. An explanation of how this project was planned and scoped, how the expert and consensus panels were chosen, the drafting of the guideline statements, and how public comment was integrated into the guidelines was included in the Methods section of our previous article.[1] The overarching questions were developed by the steering group and corresponded to typical clinical management questions of all the benign breast disease conditions, not just infectious and inflammatory lesions. We used this same framework of overarching questions for all benign breast conditions but recognized that some of the questions may not be relevant for some conditions. The methodology for development of the guidelines has been published previously.[1] Refer to the supplementary material for the current article to see the overarching clinical questions (eTable 1 in the Supplement), list of experts (eTable 2 in the Supplement), parameters for the literature yield and search strategy (eTable 3 in the Supplement), evidence summary tables for LM, GM, and PDM-SMOLD entities (eTables 4A-C in the Supplement), and list of consensus panel members (eTable 5 in the Supplement). The guidelines underwent a public comment period, and feedback from these comments was incorporated into the guidelines (eTable 6A-C in the Supplement). The final guideline statements can be found in **Table 1**, **Table 2**, and **Table 3**. Additionally, the steering group and expert panels constructed management algorithms (eFigures 1A-C in the Supplement) that align with the guidelines. eFigure 2 in the Supplement describes the surgical excision of PDM-SMOLD. Given the limited evidence and paucity of high-quality randomized studies, we did not grade the literature. Randomized clinical trials, meta-analyses, and systematic reviews were preferred, but cohort studies and case-control studies were used if the aforementioned studies were not available. Cohort studies or case-control studies older than 10 years or including fewer than 100 cases were excluded from literature review. Many of these guidelines are based on nonrandomized studies and expert opinion and interpretation; therefore, we acknowledge that other reasonable experts in this field may disagree with some of our guideline recommendations. The level of consensus from the consensus panel and the public comments drove much of the strength of consensus for these guideline statements.

Lactational Mastitis Guidelines

Initial Approach

When evaluating a patient with LM, the clinician first must evaluate for the presence of infection.

The difference between infectious and noninfectious LM is the presence of cellulitis and/or deep organ space infection.[4] Streaking and light erythema may reflect lymphatic congestion and interstitial edema but is not alone indicative of infection. Likewise, because of the high metabolic activity of the lactating breast, patients may feel systemically ill at the onset of noninfectious LM; this symptom reflects acute inflammation rather than infection.[4] These guidelines address only mastitis occurring in a lactating women in the postpartum setting, that is, LM. We have not addressed mastitis occurring in pregnant women before delivery of the baby or nonlactational abscess because of space constraints and the lack of any guidelines for management of LM, for which management is controversial.

Supportive care should be initiated first, consisting of ice and avoiding excessive removal of milk. In the setting of systemic symptoms, over-the-counter anti-inflammatory and pain relief medications can be used for a limited period of time.[4] Massage of the breast should be strictly avoided, as it causes tissue injury and can result in infectious mastitis, phlegmon, and abscess. Excessive pumping or overfeeding upregulates production of milk and worsens the symptoms of LM, and therefore, they are not recommended.[4] Consider consulting a breastfeeding medicine physician or lactation consultant to assist in management of patients with LM.

Noninfectious Mastitis

Unless a patient has performed massage, heat, and excessive pumping, the vast majority of LM will resolve with supportive care alone. Full resolution of all symptoms may take several days to 1 week. The patient should be reassured of this expected timeline with stable symptoms or gradual improvement each day.

Infectious Mastitis

Suspect infectious mastitis if a patient has performed massage, heat, and excessive pumping. However, even these patients can resolve without taking antibiotics. Unless the patient has frank cellulitis, avoid immediate initiation of medication. Reevaluate in 24 to 48 hours for worsening symptoms. If the case is stable or has improved, continue with supportive care. If antibiotics are necessary, the vast majority are safe with lactation and do not require interruption of breastfeeding. Dicloxacillin, 500 mg, by mouth 4 times daily for 10 days is the first-line treatment. For broader coverage, cephalexin, 500 mg, by mouth 4 times daily for 10 days can be used. If a patient has an allergy or methicillin-resistant *Staphylococcus aureus* is suspected, clindamycin, 300 mg, 4 times daily by mouth or trimethoprim-sulfamethoxazole DS twice daily by mouth is appropriate; use caution in mothers of premature infants or infants with hyperbilirubinemia, and avoid in mothers with glucose-6-phosphate dehydrogenase deficiency. The experts do not recommend hot compresses for the management of LM; hot compresses can exacerbate inflammation and worsen the infection.

Table 1. Guideline Statements for the Management of Lactational Mastitis

Statement	Consensus rating[a]
1. Initial approach	
1a. Clinicians should distinguish between noninfectious vs infectious mastitis for the initial management of patients with LM.	Strong consensus
1b. For patients with infectious and noninfectious LM, clinicians should institute symptom relief measures.	Strong consensus
1c. Lactating patients with noninfectious mastitis do not require antibiotics.	Strong consensus
1d. Lactating patients with infectious mastitis presenting with well-demarcated cellulitis, induration, and/or a mass require antibiotics.	Strong consensus
1e. Lactating patients with noninfectious mastitis whose symptoms do not improve within 24-48 h should be given antibiotics.	Strong consensus
1f. Clinicians should prescribe dicloxacillin and/or cephalexin as the first-line therapy for infectious LM.	Strong consensus
1g. For patients with infectious LM presenting as a phlegmon on US, clinicians should consider prescribing antibiotics for at least 10 d.	Strong consensus
1h. For patients with infectious LM with a phlegmon that does not resolve after a month despite treatment, core needle biopsy is recommended to rule out malignancy.	Strong consensus
1i. Clinicians should counsel patients that it is safe to breastfeed from a breast with infectious or noninfectious mastitis or abscess.	Strong consensus
1j. Clinicians should counsel patients with infectious LM that "emptying" the breast with massage or excessive pumping is contraindicated.	Strong consensus
2. Imaging recommended at time of diagnosis	
2a. US should be performed for patients with infectious LM with a breast mass and cellulitis at presentation.	Strong consensus
2b. US should be performed for patients with infectious LM with cellulitis whose cases do not resolve with medical or symptom management.	Strong consensus
2c. Mammograms should be performed for patients with LM if the symptoms are refractory to treatment in order to rule out a malignancy or if the patient qualifies for age-appropriate screening (when comfortable for the patient).	Strong consensus
3. Percutaneous interventions	
3a. Aspiration and culture can be attempted for lactating patients with fluid collections <3 cm. However, serial aspirations are not recommended.	Strong consensus
3b. Stab incision and gravity drain placement should be done for lactating patients with fluid collections >3 cm or when their first aspiration fails. Infected contents should be sent for culture. The drain should be placed to gravity and removed after 3-5 d.	Consensus
3c. Consider US guidance to facilitate aspiration of fluid collection, proper placement of a drain, and complete evacuation of fluid.	Consensus
3d. Patients should be counseled that it is safe to breastfeed after lidocaine injection in the breast for percutaneous procedures for infectious LM.	Strong consensus
4. Indications for surgical intervention	
4a. If a patient with a fluid collection from infectious LM is unable to tolerate a percutaneous office procedure, they should undergo the procedure in the operating room where sedation can be provided.	Strong consensus
4b. Patients with infectious LM with heavily loculated and solidified contents should undergo operative drainage in the operating room.	Strong consensus
5. Performance of the surgical procedure	
5a. For patients with infectious LM who require operative drainage, the incision to drain the area should be made as small as possible and as far away from the nipple areolar complex as possible.	Strong consensus
5b. For patients with infectious LM who require operative drainage, wound packing should be avoided, but a gravity drain should be placed and removed in a couple days.	Consensus
6. Other nonsurgical management	
None	
7. Follow-up care	
7a. Clinicians should counsel patients that recurrence of infectious LM is low when the aforementioned measures are adhered to.	Strong consensus

Abbreviations: LM, lactational mastitis; US, ultrasound.

[a] Ratings made before public comment.

Imaging Recommended at Time of Diagnosis

Ultrasound guidance for percutaneous intervention is preferred, but if it is not available, the vast majority of lactational fluid collections are superficial and accessible without ultrasound. If any concern about underlying suspicious mass exists, the patient should undergo formal ultrasound and mammography per American College of Radiology guidelines.[5]

Percutaneous Interventions

Clinicians should be aware that lactating fluid collections are highly viscous and most often do not drain well through a needle; therefore, aspiration is generally not successful for these patients.[4] Aspiration most often results in suboptimal volume removal: patients either require repeated procedures with continued growth of their unresolved fluid collection, or their skin becomes so attenuated from the

Table 2. Guideline Statements for the Management of Granulomatous Mastitis

Statement	Consensus rating[a]
1. Initial approach	
1a. For patients in whom GM is suspected, an aspiration and core needle biopsy of the abscess cavity wall should be performed. Fluid, if present, should be sent for culture (consider anaerobic, aerobic bacteria, acid fast bacilli for tuberculosis, *Corynebacterium*,[b] fungus, and mycobacteria testing).[2] Tissue should be sent for pathologic evaluation to rule out cancer and can be sent for culture if no fluid is present.	Strong consensus
1b. The following histology results on core biopsy are diagnostic of GM: Histology can include noncaseating granulomas, multinucleated giant cells, plasma cells, polymorphonuclear cells, leukocytes, lymphocytes, sterile microabscesses, or cystic neutrophilic mastitis.	Strong consensus
1c. Clinicians should inform patients that despite initiation of treatment, GM can relapse and can take up to 18 mo to resolve.	Strong consensus
1d. There is no role for empiric antibiotic use for patients with IGM without findings characteristic of CNGM and with no other associated bacterium identified.	[c]
1e. Clinicians can include symptom management as soon as possible for patients with suspected GM. Symptom management strategies can include topical nonadherent gauze pads over any open wounds, warm compresses to assist with spontaneous drainage of fluid collections, and ice for inflammation and pain relief.	Strong consensus
1f. Clinicians should consider prescribing a short course of anti-inflammatory medications (ie, celecoxib) for inflammation and/or symptom control in patients with GM.	Strong consensus
2. Nonsurgical management	
2a. Clinicians should consider nonoperative management for GM before any surgical intervention.	Strong consensus
2b. Clinicians may consider prescribing topical prednisolone steroids to apply on fistulous tracts for symptom relief for patients with GM.	Strong consensus
2c. For patients with GM with worsening symptoms, aspiration of the cavity and then injection of triamcinolone steroid into the lesion or surrounding inflamed tissue should be performed.[d] Repeated aspirations without injection of steroids is not recommended.	Strong consensus
2d. For patients with GM who have multiple abscesses, a large extent of disease, or cases refractory to intralesional steroid injections, clinicians can prescribe oral steroid taper regimens. Clinicians should consider a referral to rheumatology for high-dose steroid taper management.	Strong consensus
2e. Methotrexate or azathioprine can also be considered for patients with GM who are refractory to oral steroids, preferably in consultation with rheumatology.	Strong consensus
3. Imaging recommended at time of diagnosis	
3a. Patients at initial presentation of GM should undergo US to aid with treatment planning, and if findings are suspicious, they should have a mammogram to rule out malignancy.	Strong consensus
3b. Follow-up imaging during treatment for GM should be considered if there is symptom progression.	Strong consensus
4. Percutaneous interventions	
4a. Abscess drainage/aspiration can be performed for patients with an initial episode of GM to obtain culture material and/or for symptom relief of larger, painful abscesses. However, routine aspiration alone (without intralesional injection of steroids) is not recommended for recurrent cases (see statement 2c).	Strong consensus
5. Indications for surgical intervention	
5a. Clinicians should be aware that incision and drainage procedures for GM are rarely indicated because spontaneous drainage typically occurs. For deep or painful abscesses, aspiration with intralesional steroid injection would be recommended before an incision and drainage procedure, which can cause cosmetic deformity.	Strong consensus
5b. Surgical excision for GM is not routinely recommended and should be considered only as a last resort if the complete area can be excised.[3] Most cases of GM can be successfully managed nonoperatively.	Strong consensus
5c. Mastectomy should only be considered if mastitis involving the entire breast has been refractory to all other treatment modalities. Multidisciplinary input and patient preference should inform a decision for mastectomy for patients with GM.	Strong consensus
6. Performance of the surgical procedure	
NA	
7. Follow-up care	
7a. Clinicians should consider follow-up of GM cases every 2-4 wk for active, symptomatic cases undergoing treatment.	[c]
7b. Clinicians should offer follow-up of GM cases after initial resolution in 6-12 mo because of the refractory nature of GM.	Strong consensus

Abbreviations: CNGM, cystic neutrophilic granulomatous mastitis; GM, granulomatous mastitis; IGM, idiopathic granulomatous mastitis; NA, not applicable; US, ultrasound.

[a] Ratings made before public comment.

[b] Refer to the text for specifications on cultures for *Corynebacterium*.

[c] Statement created after public comment.

[d] US guidance is preferred.

pressure that it drains spontaneously.[4] Therefore, a stab incision and drain placement at the time of index procedure for a lactating abscess is recommended for definitive resolution with 1 procedure.

The stab incision should be performed with an 11-blade scalpel and placed as far from the nipple areolar complex as possible to reduce the risk of milk fistula.[4] Fluid should be sent for culture. Internal loculations can be disrupted with an instrument such as a hemostat. A small drain such as a ¼ Penrose, Foley catheter, or seroma catheter can be placed to gravity for 3 to 5 days. The incision site should be expected to leak milk over the next few days to a week after drain removal and gradually close.[4] Patients should be counseled to pump or feed physiologic volumes of milk (but not more than the baby needs) and to avoid pumping if the flange of the machine will traumatize the drainage site. Squeezing the drainage site or at-

Table 3. Guideline Statements for the Management of Periductal Mastitis With Squamous Metaplasia of Lactiferous Ducts

Statement	Consensus rating[a]
1. General overall comments	
1a. All patients with PDM-SMOLD who have pierced nipples should be counseled to permanently remove their nipple jewelry.	Strong consensus
1b. Patients with cleft nipples and PDM-SMOLD should be counseled to try to keep the depths of the crevice dry and free from debris.	Strong consensus
1c. When patients with a first episode of PDM-SMOLD have erythema or an abscess, antibiotics such as trimethoprim-sulfamethoxazole should be started to cover staphylococcus and possibly MRSA.	Strong consensus
1d. For patients with recurrent abscesses associated with PDM-SMOLD, clinicians should add metronidazole or clindamycin to trimethoprim-sulfamethoxazole to cover mixed flora, especially anaerobes.	Strong consensus
1e. Cultures should be obtained when pus is present in PDM-SMOLD, preferably before antibiotics are initiated. Antibiotics should be prescribed or adjusted according to the results of the culture.	Strong consensus
1f. When patients' clinical and imaging findings are not typical for PDM-SMOLD or findings do not significantly improve after treatment, a core biopsy should be performed to rule out a malignancy.	[b]
2. Imaging recommended at time of diagnosis	
2a. US should be performed for all patients initially presenting with PDM-SMOLD.	Strong consensus
2b. If a patient with PDM-SMOLD does not improve with an initial course of antibiotics after 1-2 wk, a repeat US should be obtained.	Strong consensus
2c. A mammogram should be considered for patients with PDM-SMOLD who are 30 y or older and have discordant US findings or who do not respond to treatment after 1-2 wk to rule out a malignancy.	Strong consensus
2d. When available, US guidance for aspirations of fluid collections for PDM-SMOLD should be used.	Strong consensus
3. Percutaneous interventions	
3a. For patients with PDM-SMOLD and a subareolar breast abscess, US-guided aspiration and culture of the aspirated contents for anaerobic and aerobic organisms should be performed.	Strong consensus
4. Indications for surgical intervention	
4a. Clinicians should perform an incision and drainage procedure for patients with PDM-SMOLD with breast abscesses that persist after several aspirations and for those with thin, attenuated overlying skin.	Strong consensus
4b. Clinicians should consider operative excision for a patient with PDM-SMOLD who has a fistula that persists after resolution of the initial episode.[b]	Consensus
4c. Patients with an asymptomatic, congenital cleft nipple who are not undergoing operation as treatment for PDM-SMOLD do not require surgery to correct the cleft nipple.	Strong consensus
4d. Clinicians should perform definitive operations for PDM-SMOLD during a quiescent period when acute inflammation and infection have resolved.	Strong consensus
4e. Clinicians should counsel patients that smoking cessation is encouraged but not required to undergo an operation for PDM-SMOLD.	Strong consensus
4f. Clinicians should consider surgery for recurrent episodes of PDM-SMOLD.	Consensus
5. Performance of the surgical procedure	
5a. The ducts in the central core of the nipple, the underlying sinus and scarring, and the fistula tract, if present, should generally be removed using a radial elliptical incision, although a circumareolar incision is another option for patients with PDM-SMOLD.	Consensus
5b. If a cleft or inverted nipple is present in a patient undergoing surgery for PDM-SMOLD, clinicians should correct the cleft or inverted nipple at the time of the definitive operation.	Consensus
5c. For patients who have had multiple unsuccessful operations for PDM-SMOLD and have severe deformity, clinicians should consider performing excision of the diseased tissue in conjunction with glandular remodeling or local flap rotation.	Strong consensus
6. Other nonsurgical management	
6a. Clinicians should not recommend breast duct irrigation as first-line therapy for patients with PDM-SMOLD.	Strong consensus
7. Follow-up care	
7a. Routine follow-up is not necessary for patients with PDM-SMOLD that has resolved with treatment.	Strong consensus
7b. Clinicians should counsel patients with PDM-SMOLD to stop smoking, but active smokers should not be denied care.	Strong consensus

Abbreviations: MRSA, methicillin-resistant *Staphylococcus aureus*; PDM-SMOLD, periductal mastitis with squamous metaplasia of lactiferous ducts; US, ultrasound.

[a] Ratings made before public comment.

[b] Statement created after public comment.

[c] See eFigure 2 in the Supplement for a description of this procedure.

tempting to express milk from the drainage site should be strictly avoided. If these guidelines are followed, a persistent milk fistula occurs less than 2% of the time.[4]

Indications for Surgical Intervention

Procedures in the operating room for a lactational abscess should be reserved for the minority of cases in which the patient is unable to obtain adequate analgesia in the office setting and/or if the surgeon feels they cannot access the entirety of the cavity with an awake patient.

Performance of the Surgical Procedure

Patients with LM who require drainage in the operating room for analgesia and/or surgeon comfort should undergo an incision and

drainage (I&D) procedure using the technique outlined above (in the section "Percutaneous Interventions").

Other Nonsurgical Management

While medication to decrease milk production should rarely, if ever, be needed, cabergoline, 0.5 mg, by mouth every 3 days for a total of 3 doses can be used.

Follow-Up Care

Patients should be followed up for resolution of cellulitis and closure of the milk fistula site.

Granulomatous Mastitis Guidelines

Initial Approach

Granulomatous mastitis is an inflammatory disease of the breast with a reported 0.37% incidence, which likely underestimates the actual number of women affected by the disease.[6] Granulomatous mastitis most often presents with a palpable erythematous mass and/or abscesses or inflammatory lesions of the breast, which is distinct from a traditional infection abscess, but initially can be confused as such. Granulomatous mastitis lesions tend to fistulize to the skin and spontaneously drain; the abscess material often results in no growth on cultures (sterile abscesses).[7] Granulomatous mastitis can be triggered by bacteria such as *Corynebacterium*, or more commonly, if the cause is unknown, it is termed *idiopathic granulomatous mastitis* (IGM).[8] Other less commonly reported causes of GM include tuberculosis, actinomycosis, brucellosis, histoplasmosis, other fungal diseases,[9] and immunologic conditions such as granulomatosis with polyangiitis and sarcoidosis.[10] A biopsy with a pathology diagnosis is recommended to characterize the process and determine if a specific cause is at play. This workup often includes special stains for organisms or cultures; however, negative results do not necessarily exclude infection. Consultation with the microbiology laboratory in pathology can be helpful to ensure the best culture and organism detection methods are used, depending on the clinical concerns.

Cystic neutrophilic granulomatous mastitis (CNGM) is a specific form of GM associated with a granulomatous response to *Corynebacterium* infection resulting in robust lobulocentric granulomatous inflammation with characteristic cystic spaces/lipid vacuoles rimmed by neutrophils and epithelioid histiocytes.[2] The lipid vacuoles can contain gram-positive bacilli supporting *Corynebacterium* infection; however, CNGM can be diagnosed (or placed high in the differential) in the absence of these findings since Gram stain and microbiologic cultures have a reported false-negative rate of more than 50% (due to scarcity of organisms, prior antibiotic treatment, and special culture requirements).[11-14] *Corynebacterium*'s lipophilic nature requires specific culture medium containing 1% polysorbate 80 as well as long incubation periods. Patients with CNGM can initially be treated with doxycycline antibiotics and treatment following the management guidelines outlined below. For patients with IGM without findings characteristic of CNGM and no other associated bacterium identified, there is no role for empiric antibiotic use.

Patients should be informed that they may experience protracted and/or recurrent symptoms until the disease is fully eradicated.[15] According to the report of the American Society of Breast Surgeons IGM registry, 25.3% of patients experienced relapse of their symptoms, despite optimal management, and others have reported similar recurrence rates.[3,16-18]

Nonsurgical Management

Mild GM symptoms can be observed with instructions for supportive wound care and oral anti-inflammatory medications such as celecoxib or ibuprofen. Topical steroids are an option for treatment of chronic, draining skin fistulas and open wounds but are less effective for lesions deep to the epidermis.[19] Repeated aspiration without intralesional steroid injection (ILS) for abscesses is not recommended. Moderate disease may benefit from ILS as a first-line intervention.[20,21] For those patients who require ILS, aspiration of lesion fluid should first be performed, and then steroids should be subsequently injected into the cavity wall or surrounding inflammatory phlegmon. An ILS injection mixture consists of 40 mg/1 mL of triamcinolone mixed with 1% to 2% lidocaine.[22,23]

Severe or refractory IGM or CNGM disease may require repeat ILS as well as oral steroids or other immunosuppressive agents, and a consultation to rheumatology is recommended.[24] Patients refractory to ILS or topical treatments should be considered candidates for oral steroids.[25] If a rheumatology consultant is not available, other possible referrals could include dermatology, depending on local resources and their comfort level in managing GM. Steroids and immunosuppressive agents should be prescribed by rheumatology or another referring physician with expertise in prescribing these medications. Studies evaluating high- vs low-dose steroids have reported that a high-dose steroid taper is most effective.[26] Prednisone, 60 mg, as a starting dose with a 4- to 6-month taper has been described as providing resolution.[27] However, given the significant morbidity associated with long-term use of oral steroids, some investigators have recommended pursuing definitive treatment with immunosuppressants such as methotrexate or azathioprine.[26,28,29]

Imaging Recommended at Time of Diagnosis

Mammographic characteristics of patients with GM typically demonstrate an asymmetry or irregularly shaped masses. Ultrasound typically shows a hypoechoic, irregular mass, hyperemia, and/or phlegmon.[30] These lesions can be associated with enlarged, reactive, and suspicious axillary lymph nodes.[7] Though not recommended as standard imaging, breast magnetic resonance imaging reveals nodular lesions with ring enhancement and can give a more accurate picture of the extent of disease than a mammogram or ultrasound.[30] Core needle biopsy should be performed to exclude malignancy and to evaluate for the presence of noncaseating granulomas, multinucleated giant cells, and plasma cell infiltrates, which are characteristic of GM.[7]

Percutaneous Interventions

A minimally invasive approach is preferred for inflammatory lesion fluid collections necessitating drainage, as patients can develop reactive, large, chronic open wounds after open invasive procedures, which can result in considerable pain, distress, and increased health care costs.

If available, ultrasound can be used as image-based guidance for aspiration and ILS. For those patients who require ILS, please

follow the section "Nonsurgical Management" above. Aspiration or a small stab incision is less invasive than an open I&D procedure and much easier to heal.

Indications for Surgical Intervention

As management shifts to medical interventions, surgical excision in the operating room should be reserved for refractory cases for which all other interventions failed. Considerations with an operative procedure include minimizing incision size and disruption of tissue. Mastectomy is rarely indicated and really should be avoided in almost every case. Mastectomy should only be considered after extensive multidisciplinary discussion.[7] Caution should be exercised when performing a mastectomy for GM because of the increased potential for wound dehiscence and recurrence.

Performance of the Surgical Procedure

Any drainage procedure performed in the operating room should follow principles outlined above in the sections "Indications for Surgical Intervention" and "Percutaneous Interventions."

Follow-Up Care

Given the heterogeneity of disease, mild cases of GM may resolve without the need for oral therapeutics or repeated procedures. Patients with moderate to severe GM may require multiple ILS and systemic treatment and may take longer to resolve. Active follow-up and symptom management during flares is necessary. Imaging response is a better clinical indicator of resolution than clinical response; therefore, patients should be followed up until imaging normalizes.[17,31,32]

Periductal Mastitis With Squamous Metaplasia of Lactiferous Ducts Guidelines

Initial Approach

Periductal mastitis with squamous metaplasia of lactiferous ducts, commonly called Zuska disease, has been recognized as a distinct clinical entity in need of treatment guidelines. The clinical findings sometimes overlap with those seen in duct ectasia with plasma cell mastitis, causing confusion. In PDM-SMOLD, healthy cuboidal epithelium of the terminal ducts undergoes abnormal transition to squamous metaplasia that leads to obstruction of the duct and sinus by the keratin that is produced.[33] This phenomenon is not seen in other subareolar conditions. If those ducts are not removed at the time of the definitive operation, there is a very high chance of recurrence of the inflammation, abscesses, and fistulas.[34]

Although periareolar erythema, tenderness, and even a palpable mass may be inflammatory and not infectious, it is not possible to differentiate the 2 conditions; therefore, antibiotics should be used when symptoms first appear to decrease the likelihood of abscess formation. However, caution should be taken regarding the possibility of developing resistant organisms. *S aureus* (increasingly methicillin resistant) is the most common organism present in patients' first episode of PDM-SMOLD.[33,34] An antibiotic with adequate staphylococcus coverage, such as trimethoprim-sulfamethoxazole, should be instituted. For recurrent cases, mixed flora, especially anaerobes, are more common, and antibiotics such as metronidazole or clindamycin should be added. Depending on the response to the antibiotics, the pathways outlined in the algorithm (eFigure 1C in the Supplement) should be followed. Often, the acute process will resolve without further intervention. If the inflammatory/infectious process heals with antibiotics alone, patients who smoke should be counseled on the relationship between smoking and PDM-SMOLD and be advised to stop cigarette smoking for multiple health-related reasons. Patients who have pierced nipples should permanently remove the jewelry to prevent further ductal inflammation and worsening of the squamous metaplasia.

Imaging Recommended at Time of Diagnosis

An ultrasound should be performed on patients at the time of initial presentation and repeated periodically if the patient is not responding to treatment. A mammogram is usually not helpful in making a diagnosis of PDM-SMOLD, and it should be performed only if the clinical presentation suggests malignancy or the patient does not respond to treatment within 1 to 2 weeks.

If available, ultrasound guidance for drainage of fluid collections in PDM-SMOLD is recommended. A meta-analysis by Zhou et al[35] concluded successful aspiration of breast abscesses was unrelated to the use of ultrasound, but that conclusion should be interpreted with caution because this study did not exclusively include patients with PDM-SMOLD. Ultrasound guidance facilitates proper placement of the needle, complete evacuation of contents, irrigation of the cavity, and monitoring for recurrence.[36] Until further data are available, it seems prudent to use ultrasound guidance when it is readily available.

Percutaneous Interventions

When an abscess develops, it usually requires some type of drainage for resolution. For most subareolar breast abscesses less than 3 to 5 cm in diameter, an initial attempt at aspiration should be considered before I&D. Several aspirations might be necessary to achieve resolution. A meta-analysis showed aspiration resulted in the same cure rate in a shorter period of time with a better cosmetic result compared with I&D.[35] It is important to note that only 2 of the 9 trials contained a minority of patients who were nonlactational, and the other 7 trials had no nonlactational patients. The trials with nonlactational patients showed faster healing with aspiration.[37] Aspiration is also being increasingly used for large, multiloculated abscesses, and no evidence clearly supports initial I&D over aspiration. Abscesses that persist after several aspirations and those with thin, attenuated overlying skin should be managed with I&D. The procedure can usually be performed in an office setting with local anesthesia. A small incision without drains or packing is most often adequate.

Indications for Surgical Intervention

In general, an operation is not indicated for patients who have complete resolution of symptoms after only 1 episode of PDM-SMOLD. An operation should be considered if a patient has at least 1 recurrence unless there has been a long interval (a year or more) between episodes. If a patient develops a persistent fistula, even after the first episode, an operation should be considered. In the absence of symptoms, a cleft nipple is not an indication for an operation, but the cleft should be corrected at the time of definitive operation for symptomatic disease.

Performance of the Surgical Procedure

Definitive operations should be performed during a quiescent period when acute inflammation and infection have resolved. There is no evidence to support the notion that cessation of smoking reverses PDM-SMOLD changes once patients have become symptomatic, nor is there evidence that cigarette smoking interferes with primary healing of the nipple-areolar complex after operations for PDM-SMOLD. Therefore, patients should not be required to stop cigarette smoking as a prerequisite for an operation.

A meta-analysis showed good results using antibiotic coverage for surgical excision of the diseased ducts within the nipple along with the inflammatory tissue and the fistulous tract, if present.[38] Excision was reported to have a 7.5% treatment failure rate using a circumareolar incision and a 0.6% failure rate with a radial incision.[38] Failure rates in the reported studies varied widely between 0 and 62.5%; the statistical analysis using such widely divergent results was probably flawed. However, there is likely at least a trend favoring radial incision. In addition to removing the diseased ducts within and just below the nipple, if a cleft or inversion is present within the nipple, it should be corrected at the time of the definitive operation. Details of the operation are available in eFigure 2 in the Supplement.[39] For patients who have had multiple unsuccessful operations and have severe deformity, excision of the diseased tissue in conjunction with glandular remodeling[40] or flap rotation[41] should be considered.

Other Nonsurgical Management

A meta-analysis[38] suggested that breast duct irrigation be considered first-line therapy for PDM-SMOLD, but the recommendation was based on 2 studies, 1 of which had a 50% failure rate for patients with PDM-SMOLD.[42] The majority of patients in the other study had duct ectasia and plasma cell mastitis rather than PDM-SMOLD.[43] In view of excellent results with a limited, targeted excision, duct irrigation is not recommended.

Follow-Up Care

There is no need for routine interval follow-up if the patient remains asymptomatic after resolution with antibiotic treatment or operation.

Conclusions

The treatment pathways outlined herein reflect movement toward minimally invasive interventions and utilization of adjunctive medical therapies for disease resolution, although some infectious entities still require an operative procedure for resolution. Future directions include exploration of new agents applicable to the treatment of GM and insight into prevention of PDM-SMOLD.

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REFERENCES

1. Rosenberger LH, White RL, Tafra L, et al. American Society of Breast Surgeons and Society of Breast Imaging 2025 guidelines for the management of benign breast fibroepithelial lesions. *JAMA Surg*. 2025;160(12):1378-1385. doi:10.1001/jamasurg.2025.4392

2. Aljawder AAA, Li JJX, Ng JKM, et al. Idiopathic granulomatous mastitis and cystic neutrophilic granulomatous mastitis: two sides of the same coin or distinct entities? *Pathology*. 2023;55(3):335-341. doi:10.1016/j.pathol.2022.09.005

3. Velidedeoglu M, Umman V, Kilic F, et al. Idiopathic granulomatous mastitis: introducing a diagnostic algorithm based on 5 years of follow-up of 152 cases from Turkey and a review of the literature. *Surg Today*. 2022;52(4):668-680. doi:10.1007/s00595-021-02367-6

4. Mitchell KB, Johnson HM, Rodríguez JM, et al; Academy of Breastfeeding Medicine. Academy of Breastfeeding Medicine clinical protocol #36: the mastitis spectrum, revised 2022. *Breastfeed Med*. 2022;17(5):360-376. doi:10.1089/bfm.2022.29207.kbm

5. Niell BL, Jochelson MS, Amir T, et al; Expert Panel on Breast Imaging. ACR Appropriateness Criteria® female breast cancer screening: 2023 update. *J Am Coll Radiol*. 2024;21(6S):S126-S143. doi:10.1016/j.jacr.2024.02.019

6. Wolfrum A, Kümmel S, Theuerkauf I, Pelz E, Reinisch M. Granulomatous mastitis: a therapeutic and diagnostic challenge. *Breast Care (Basel)*. 2018;13(6):413-418. doi:10.1159/000495146

7. Bede K, Valente SA. Idiopathic granulomatous mastitis. *Ann Breast Surg*. 2020;4:4. doi:10.21037/abs-20-89

8. Dobinson HC, Anderson TP, Chambers ST, Doogue MP, Seaward L, Werno AM. Antimicrobial treatment options for granulomatous mastitis caused by Corynebacterium species. *J Clin Microbiol*. 2015;53(9):2895-2899. doi:10.1128/JCM.00760-15

9. Merino-Alado R, Pineda J, Rasquin JH, Landaeta ME, Mata-Essayag S. Granulomatous mastitis due to coinfection with *Histoplasma sp.* and *Paracoccidioides sp.*: a case report. *Med Mycol Case Rep*. 2020;27:52-54. doi:10.1016/j.mmcr.2020.01.006

10. DeRemee RA. Sarcoidosis and Wegener's granulomatosis: a comparative analysis. *Sarcoidosis*. 1994;11(1):7-18.

11. D'Alfonso TM, Moo TA, Arleo EK, Cheng E, Antonio LB, Hoda SA. Cystic neutrophilic granulomatous mastitis: further characterization of a distinctive histopathologic entity not always demonstrably attributable to corynebacterium infection. *Am J Surg Pathol*. 2015;39(10):1440-1447. doi:10.1097/PAS.0000000000000479

12. Troxell ML, Gordon NT, Doggett JS, et al. Cystic neutrophilic granulomatous mastitis: association with gram-positive bacilli and Corynebacterium. *Am J Clin Pathol*. 2016;145(5):635-645. doi:10.1093/ajcp/aqw046

13. Turashvili G, Li X. Inflammatory lesions of the breast. *Arch Pathol Lab Med*. 2023;147(10):1133-1147. doi:10.5858/arpa.2022-0477-RA

14. Wang M, Zhang D, Fu N, et al. Clinical features of cystic neutrophil granulomatous mastitis in 62 cases. *Heliyon*. 2025;11(3):e42415. doi:10.1016/j.heliyon.2025.e42415

15. Bhattarai P, Srinivasan A, Valenzuela CD, Sulzbach C, Wallack MK, Mariadason JG. Idiopathic granulomatous mastitis: experience at a New York hospital. *Ann R Coll Surg Engl*. 2022;104(7):543-547. doi:10.1308/rcsann.2021.0239

16. Kapoor NS, Ryu H, Smith L, Zou J, Mitchell K, Blair SL. Presentation and management of granulomatous mastitis in the United States: results of an American Society of Breast Surgeons registry study. *Ann Surg Oncol*. 2024;31(11):7396-7404. doi:10.1245/s10434-024-15714-x

17. Çetin K, Sıkar HE, Göret NE, et al. Comparison of topical, systemic, and combined therapy with steroids on idiopathic granulomatous mastitis: a prospective randomized study. *World J Surg*. 2019;43(11):2865-2873. doi:10.1007/s00268-019-05084-x

18. Davis J, Cocco D, Matz S, et al. Re-evaluating if observation continues to be the best management of idiopathic granulomatous mastitis. *Surgery*. 2019;166(6):1176-1180. doi:10.1016/j.surg.2019.06.030

19. Azzam MI, Alnaimat F, Al-Nazer MW, et al. Idiopathic granulomatous mastitis: clinical, histopathological, and radiological characteristics and management approaches. *Rheumatol Int*. 2023;43(10):1859-1869. doi:10.1007/s00296-023-05375-6

20. Zhang Q, Zhang W, Lv J, Zhang Z, Zhao Y. The effect of local steroid administration on idiopathic granulomatous mastitis: a systematic review and meta-analysis. *J Surg Res*. 2024;295:511-521. doi:10.1016/j.jss.2023.11.024

21. Wijesinghe A, Lakmal K, Senevirathna J, et al. The use of intralesional corticosteroids in idiopathic granulomatous mastitis: a systematic review. *Eur J Breast Health*. 2024;20(4):233-240. doi:10.4274/ejbh.galenos.2024.2024-5-2

22. Moldoveanu D, Lee C, Hesley G. Framework and guide for intralesional steroid injections in idiopathic granulomatous mastitis. *Eur J Radiol*. 2023;168:111118. doi:10.1016/j.ejrad.2023.111118

23. Toktas O, Konca C, Trabulus DC, et al. A novel first-line treatment alternative for noncomplicated idiopathic granulomatous mastitis: combined intralesional steroid injection with topical steroid administration. *Breast Care (Basel)*. 2021;16(2):181-187. doi:10.1159/000507951

24. Parperis K, Theodoridou M. Is granulomatous mastitis a rheumatologic disease? the emerging role of rheumatologists in disease management. *Rheumatol Int*. 2025;45(5):93. doi:10.1007/s00296-025-05849-9

25. Wang P, Sun JZ, Fang HY, Yang DJ, Ren GS. Optimal timing for corticosteroid therapy in idiopathic granulomatous mastitis: a retrospective analysis highlighting early intervention efficacy. *J Inflamm Res*. 2024;17:9617-9624. doi:10.2147/JIR.S498018

26. Montazer M, Dadashzadeh M, Moosavi Toomatari SE. Comparison of the outcome of low dose and high-dose corticosteroid in the treatment of idiopathic granulomatous mastitis. *Asian Pac J Cancer Prev*. 2020;21(4):993-996. doi:10.31557/APJCP.2020.21.4.993

27. Pandey TS, Mackinnon JC, Bressler L, Millar A, Marcus EE, Ganschow PS. Idiopathic granulomatous mastitis: a prospective study of 49 women and treatment outcomes with steroid therapy. *Breast J*. 2014;20(3):258-266. doi:10.1111/tbj.12263

28. Kaya MN, Tekgöz E, Çolak S, Kılıç Ö, Çınar M, Yılmaz S. Impact of methotrexate monotherapy in patients with idiopathic granulomatous mastitis. *Postgrad Med*. 2025;137(5):404-407. doi:10.1080/00325481.2025.2502322

29. Haddad M, Sheybani F, Arian M, Gharib M. Methotrexate-based regimen as initial treatment of patients with idiopathic granulomatous mastitis. *Breast J*. 2020;26(2):325-327. doi:10.1111/tbj.13590

30. Barreto DS, Sedgwick EL, Nagi CS, Benveniste AP. Granulomatous mastitis: etiology, imaging, pathology, treatment, and clinical findings. *Breast Cancer Res Treat*. 2018;171(3):527-534. doi:10.1007/s10549-018-4870-3

31. Rona G, Arifoglu M, Cetin K, Kundes MF. Relationship of post-treatment radiological findings with relapses in idiopathic granulomatous mastitis patients. *North Clin Istanb*. 2024;11(5):391-397. doi:10.14744/nci.2023.32309

32. Çetin K, Sıkar HE, Feratoğlu F, Taşdoğan B, Güllüoğlu BM. Treatment of granulomatous mastitis with steroids: should the decision to end the treatment be made radiologically? *Eur J Breast Health*. 2023;20(1):25-30. doi:10.4274/ejbh.galenos.2023.2023-9-2

33. Meguid MM, Oler A, Numann PJ, Khan S. Pathogenesis-based treatment of recurring subareolar breast abscesses. *Surgery*. 1995;118(4):775-782. doi:10.1016/S0039-6060(05)80049-2

34. Versluijs-Ossewaarde FN, Roumen RM, Goris RJ. Subareolar breast abscesses: characteristics and results of surgical treatment. *Breast J*. 2005;11(3):179-182. doi:10.1111/j.1075-122X.2005.21524.x

35. Zhou F, Li Z, Liu L, et al. The effectiveness of needle aspiration versus traditional incision and drainage in the treatment of breast abscess: a meta-analysis. *Ann Med*. 2023;55(1):2224045. doi:10.1080/07853890.2023.2224045

36. Ghunaim H. Percutaneouse ultrasound-guided needle aspiration for management of breast abscesses: a review. *J Med Radiat Sci*. 2023;70(3):327-337. doi:10.1002/jmrs.682

37. Naeem M, Rahimnajjad MK, Rahimnajjad NA, Ahmed QJ, Fazel PA, Owais M. Comparison of incision and drainage against needle aspiration for the treatment of breast abscess. *Am Surg*. 2012;78(11):1224-1227. doi:10.1177/000313481207801129

38. Xu H, Liu R, Lv Y, et al. Treatments for periductal mastitis: systematic review and meta-analysis. *Breast Care (Basel)*. 2022;17(1):55-62. doi:10.1159/000514419

39. Snider HC. Management of mastitis, abscess, and fistula. *Surg Clin North Am*. 2022;102(6):1103-1116. doi:10.1016/j.suc.2022.06.007

40. Giacalone PL, Rathat G, Fournet S, Rouleau C. Surgical treatment of recurring subareolar abscess using oncoplastic techniques. *J Visc Surg*. 2010;147(6):e389-e394. doi:10.1016/j.jviscsurg.2010.10.008

41. Zhang X, Lin Y, Sun Q, Huang H. Dermo-glandular flap for treatment of recurrent periductal mastitis. *J Surg Res*. 2015;193(2):738-744. doi:10.1016/j.jss.2014.07.067

42. Chen K, Zhu L, Hu T, et al. Ductal lavage for patients with nonlactational mastitis: a single-arm, proof-of-concept trial. *J Surg Res*. 2019;235:440-446. doi:10.1016/j.jss.2018.10.023

43. Wu HL, Yu JJ, Yu SL, Zhou BG, Bao SL, Dong Y. Clinical efficacy of fiberoptic ductoscopy in combination with ultrasound-guided minimally invasive surgery in treatment of plasma cell mastitis. *Clin Exp Obstet Gynecol*. 2016;43(5):742-746. doi:10.12891/ceog3098.2016