Breast Pain: Engorgement, Nipple Pain, and Mastitis

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Abstract: This review explores current concepts surrounding breastfeeding complications including nipple pain and trauma, breast engorgement, mastitis, and breast abscess. The review discusses possible etiologies, risk factors, incidence, differential diagnosis, and suggested treatment strategies. The evidence that supports these management options is discussed. Key words: breastfeeding, lactation, breast engorgement, nipple pain, mastitis, breast abscess

Despite excellent antenatal breastfeeding education, concerns such as engorgement, nipple trauma, pain, and breast infections may still occur. The obstetric care provider who is knowledgeable regarding lactation complications will be better-suited to manage their patients' breastfeeding concerns.

Breast and Nipple Pain

Early nipple sensitivity and breast engorgement are common complaints in breastfeeding women. Information from the Infant Feeding Practices Survey in 2008 found that some level of breast pain in the first 2 weeks of breastfeeding was common. During the first day, 73.7% of the 1902 women responding reported some pain. Using a scale from 0 (no pain) and 10 (worst possible pain) during the first week of breastfeeding nearly all mothers reported some pain with only 3.3% giving a rating of 0. A total of 58.8% reported that the pain during the first week was rated as 5 or greater. Pain continued into the second week with 85.9% of women continuing to note pain during that time, although only 33.9% reported that the pain was 5 or greater.¹ The etiology for this pain is not well delineated. Hormonal influences likely play a role. In most postpartum circumstances there is no potential to change hormonal related sensitivity (excluding abnormal circumstances such as retained placental tissue). Some early nipple pain can also be related to suboptimal positioning and latch. Previous recommendations to prepare the nipples for breastfeeding using various techniques to “toughen” tissues have not been found to be beneficial and should not be recommended. Early attention to confirm correct positioning and latch and evaluation by experienced personnel to assure these are optimized in the early postpartum
period can help mitigate nipple trauma which then can worsen nipple pain. Not surprisingly, when trauma to the nipple occurs with breakdown of skin and fissuring, pain occurs and this breakdown in the integrity of the nipple can lead to other complications of breastfeeding such as mastitis and early breastfeeding termination. In a study of both mothers who had pain during breastfeeding with normal appearing nipples and those with pain with visible trauma, pain frequently started in the first postpartum week for both groups but was found to be shorter in duration and higher in intensity in the group with visible trauma. Mothers reporting the following characteristics were less likely to meet their breastfeeding goals: baby had trouble with latching, my nipples were sore, cracked or bleeding, and breastfeeding was too painful. Some infant suck characteristics may also play a role in pain. Mothers’ of infants that exerted higher suck pressures were more likely to report pain.

When nipple pain persists beyond the initial period or begins later in breastfeeding a detailed history and evaluation to explore the etiology of the pain should be pursued in an attempt to clarify the cause. Although improper positioning and latch are commonly occurring causes of early breast pain, they should still be considered as a possible causative factor in the older child who has previously been breastfeeding without pain due to new concerns such as distraction, loss of vigilance of the latch, teething, infant nasal congestion, among other potential causes. Once latch, positioning, and traumatic issues have been evaluated and ruled out, other causes for pain should be investigated. The work-up for persistent pain in addition to suboptimal latch includes: dermatitis, infections, vasospasm/Raynaud’s, depression, functional pain, and other rare concerns (Table 1).

Treatment of persistent nipple and breast pain should be directed at the underlying problem if it can be identified. The use of serial pain scales may be helpful in quantifying and monitoring symptom improvement for these potentially persistent concerns. In addition, early depression screening using a tool such as the Edinburg Postpartum Depression Scale can be used to monitor patient frustration and depression that may compound pain and infant feeding difficulties. Working in conjunction with an International Board Certified Lactation Consultant or other lactation expert to evaluate for latch and feeding related concerns is indicated. Improper latch and positioning should be corrected in an attempt to reduce pain and nipple trauma. Early nipple trauma is common with 1 study suggesting that up to 58% of women had trauma in the first week, the incidence then decreased but 8% continued to have trauma at 8 weeks. If visible nipple trauma is apparent, the latch should be optimized to allow healing. Fissuring of the nipple increases risk for bacterial infection. The latch should be improved to reduce trauma and allow healing and good wound care principals applied. The use of topical antibiotics is occasionally used although data on effectiveness is limited. A single study randomizing 151 women with nipple damage to either an all-purpose nipple ointment (APNO) or lanolin failed to find any difference in pain between groups at 1 week of treatment with both groups reporting a similar improvement in their pain. Topical steroids could potentially be harmful when trauma/fissuring is present as they can delay healing. If no nipple trauma is identified on inspection that does not rule out difficulties with latch as the cause for pain. A systematic review on nipple pain management found only 4 trials of good quality, which looked at treatment options of glycerin pads, lanolin (either with or without breast shells), expressed breastmilk, and APNO. This review found insufficient evidence to recommend any of these therapies but did
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<th>Potential Causes of Nipple/Breast Pain</th>
<th>Considerations</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>May or may not have visible trauma</td>
<td>Optimize supply</td>
</tr>
<tr>
<td>Low milk supply/high suction</td>
<td>Observe feeding</td>
<td>Suck training/physical therapy</td>
</tr>
<tr>
<td>Dysfunctional suck</td>
<td>Inspect nipple after feeding for misshapen nipple</td>
<td></td>
</tr>
<tr>
<td>Tongue tie/ankyloglossia/lip tie</td>
<td></td>
<td>Frenotomy</td>
</tr>
<tr>
<td>Oversupply</td>
<td></td>
<td>Manage supply, alter feeding pattern/position, manage vigorous let-down</td>
</tr>
<tr>
<td>Pump effects</td>
<td></td>
<td>Assure flanges fit appropriately and suction level appropriate</td>
</tr>
<tr>
<td>Trauma</td>
<td>Visible trauma</td>
<td>Improve latch/control pain</td>
</tr>
<tr>
<td>Infectious</td>
<td>May have associated Staph on nipple Cx</td>
<td>Unclear role of topical agents such as antibiotics</td>
</tr>
<tr>
<td>Viral: HSV 1 or II</td>
<td>Typically acute onset of pain/symptoms</td>
<td>Antiviral medication</td>
</tr>
<tr>
<td>Herpes Zoster (Shingles)</td>
<td>Primary episode possible larger ulceration</td>
<td>Cover lesions distant to nipple/areola</td>
</tr>
<tr>
<td></td>
<td>Painful vesicular lesions for recurrence</td>
<td>Avoid BF that side if lesions on nipple/areola</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good hygiene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider Varicella vaccination of eligible child for Shingles exposure</td>
</tr>
<tr>
<td>Bacterial mastitis</td>
<td>Erythematous wedge-shaped tender region on breast</td>
<td>Conservative management with breast drainage may be attempted</td>
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<tr>
<td></td>
<td>Fever, flu-like symptoms</td>
<td>For 12-24 h in stable patient with mild symptoms</td>
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<td></td>
<td></td>
<td>If ill appearing, severe illness of failed conservative therapy</td>
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<tr>
<td></td>
<td></td>
<td>Begin antibiotics to cover penicillinase-producing bacteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognize and treat predisposing factors</td>
</tr>
<tr>
<td>Candida</td>
<td>Superficial nipple/areolar erythematous rash</td>
<td>Topical antifungal agent</td>
</tr>
<tr>
<td></td>
<td>卫星皮疹</td>
<td></td>
</tr>
<tr>
<td>Dermatitis</td>
<td>Poor breast drainage</td>
<td>Topical steroid</td>
</tr>
<tr>
<td>Eczema</td>
<td>Prior history of these conditions supportive</td>
<td>Identify/remove instigating agent for contact dermatitis</td>
</tr>
<tr>
<td>Psoriasis</td>
<td>No history—consider biopsy to r/o Paget’s</td>
<td></td>
</tr>
<tr>
<td>Contact dermatitis</td>
<td>Prior history of Raynaud’s on fingers/toes supportive</td>
<td>Maintain warmth</td>
</tr>
<tr>
<td>Vasospasm/Raynaud’s</td>
<td>Visual inspection after feed/pumping for color</td>
<td>Nifedipine</td>
</tr>
<tr>
<td></td>
<td>Blanching (white) reperfusion blue to red</td>
<td>Look for underlying trigger for vasospasm</td>
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find that in most women, pain improved 7 to 10 days postpartum regardless of intervention.\(^7\)

Other causes of nipple or breast pain excluding trauma may be noted on examination and addressed as indicated. Dermatitis may affect the nipples just as other areas of the body. Women with a known history of eczema or psoriasis may have these occur on the nipples and they should be appropriately treated. A similar dermatologic issue on the nipple without a prior history of such disease should prompt investigation to rule out the rare possibility of Paget’s disease. Contact dermatitis can also occur on the breast either related to contact with the baby’s oral cavity or any applied topical agents such as lanolin or pump flanges. Herpes viral infections can occur on the nipple. This can have the classic clustered vesicular appearance with subsequent ulceration and tenderness or a primary infection can appear as tender ulceration. The consequences of herpes in the newborn can be severe and clinical suspicion of such an infection should be communicated to the pediatric care provider. Other infections such as mastitis should be visible on examination due to breast erythema and tenderness. A breast examination to rule out masses should also be performed in situations of persistent breast pain to rule out possible breast abscess, lactating adenoma, plugged milk ducts, or other conditions that would warrant specific evaluation and treatment.

Inspection of the infant’s mouth to assess for tongue tie, infection, and abnormal suck mechanics should be performed to evaluate continued pain. If the mother of the infant with tongue tie has persistent pain, frenotomy is indicated to improve latch and potentially resolve the pain.\(^8,9\) As the infant with tongue tie may have learned unusual tongue mechanics, releasing the tongue tie may not instantly improve pain. If no abnormalities are noted related to the infant’s oral cavity and no nipple or breast abnormalities are noted on examination, observing infant feeding or pumping if applicable can provide additional information to assist with diagnosis and management.

Assessing feeding and milk supply can provide information not just related to latch, but other information such as overactive milk ejection. In this situation, the infant can be found to clamp down to limit the rapid flow of milk that can then result in trauma and discomfort. Oversupply and persistent breast engorgement can also result in pain. Efforts to slow rapid milk flow or moderate oversupply of milk can be helpful in improving pain. Low milk supply can also theoretically result in pain in some situations due to overly long periods of time nursing and pumping or unusually high pump pressures or overly vigorous use of massage that can also traumatize tissues. For pumping women, additionally, the fitting of the pump parts that are used should be assessed. Although some reports suggest that milk expression has been associated with breast pain and nipple trauma, this is an inconsistent finding.\(^10\) The association

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<tbody>
<tr>
<td>Depression</td>
<td>Routine screening for depression</td>
<td>Pain control Counseling or antidepressants as appropriate</td>
</tr>
<tr>
<td>Functional pain/unknown</td>
<td>Normal examination/apparently normal feeding</td>
<td>Provide support and manage pain Consider use of antibiotics/probiotics</td>
</tr>
</tbody>
</table>

BF indicates breastfeeding.
between milk expression, pumping, and pain is inadequately researched and further investigation in this area is needed.

Another potential etiology for nipple pain that can be noticed upon observation of a feeding is nipple vasospasm. A careful history assessing for other evidence of Raynaud’s phenomenon can suggest that this diagnosis be considered. Although vasospasm may occur secondary to another etiology, in some circumstances it can exist independently as the cause of pain. The typical physical findings include initial blanching of tissues followed by reperfusion color change from bluish to red. Although the incidence of vasospasm as a cause for nipple pain has varied between research settings, the recent CASTLE study found an incidence as high as 22% of breastfeeding women at 8 weeks postpartum. Although the mean pain scores of women with vasospasm were higher than those without vasospasm, the women in this study did not report pursuing any treatment of their vasospasm. Purported treatments for vasospasm include maintaining warmth, nonsteroidal medications, and the use of nifedipine. A small study of patients referred for treatment of Raynaud’s during lactation found that 20/22 had previously failed treatment for suspected Candida. Of the 12 patients who tolerated therapy with nifidepine, 83% reported either decrease or resolution of their pain. The association between persistent breast pain and candida infection remains unclear. Topical candida infections may appear as an erythematous rash on the nipple/areola with classic “satellite” lesions near the periphery of the erythematous border. This can be treated with a topical antifungal agent. Some researchers have suggested an association between deep breast pain radiating to the chest wall and axilla to candida infections even in the presence of a normal breast examination. Invasive candidal infections are rare in immunocompetent adults. Candida albicans is an ubiquitous organism and can frequently be cultured from both the oral cavity of breastfeeding infants as well as the asymptomatic mother’s nipples. Candida was found on nipple swabs of both asymptomatic breastfeeding (34%) and nonbreastfeeding (18%) mothers and species were concordant in 81% of cases. The fact that yeast may be commonly cultured from the nipple in the absence of symptoms complicates the interpretation of nipple culture results. The role of candida in causing breast pain in the absence of physical findings of infection is therefore difficult to delineate. A prospective study by Hale et al using milk cultures in women with clinical symptoms previously attributed to candida such as deep breast pain radiating to chest wall failed to find an association with candida.

The association of chronic breast pain to a subclinical bacterial infection in the absence of other local or systemic evidence of infection has also been theorized. Researchers have suggested that when fissuring of the nipples is present, Staphylococcus aureus is more likely to be found on culture than candida. Treatment of women with nipple fissuring and pain with oral antibiotics reduced symptoms (8% for those managed with optimal breastfeeding technique alone compared with 79% for those given oral antibiotics), additionally their risk of subsequent mastitis fell from 25% to 5% in the treated group. A study performed by Witt et al found that in their clinic, the 2 most common reasons for consultation were low supply (32%) and breast pain (48%). During their study period of the 237 women seen for pain, 89 had pain lasting for >1 week with no evidence of acute inflammation. Women had both breastmilk and nipple cultures performed and were randomized to conservative measures (mechanical correction, lactation support, and topical ointment such as APNO or mupurcin ± triamcinolone)
or oral antibiotics (first-line choice dicloxacillin). Failure of conservative management after 5 or more days was considered an indication to offer oral antibiotics. This study found that those ultimately receiving antibiotics had higher baseline pain scores and were more likely to have breastmilk cultures that grew *S. aureus* (33% vs. 5%, *P* = 0.001). Pain resolved similarly over the 12-week time period in both the conservative management group and those receiving antibiotics. There was no difference in weaning between groups. In addition, a study by Eglash et al found that in women with chronic pain prolonged use of antibiotics improved pain in the majority of cases.

The normal verses impaired microbial environment of the breast during lactation and any potential association to chronic breast pain is yet to be fully explored. Emerging theories related to biofilms, virulence factors, and immunologic components of milk in maintaining normal flora are potential areas for future investigation. The potential impact of probiotics in altering this microbiome is unclear.

Another concern to address in women with chronic breast pain is the potential association with depression. Amir and colleagues gave the Edinburgh Postnatal Depression Scale (EDPS) to breastfeeding women either with or without nipple pain. Women with pain had a much higher likelihood of having a score consistent with depression (38%) than those without pain (14%). In addition, when their pain resolved, their scores normalized falling to a rate of 16%. In a secondary analysis of data from the Infant Feeding Practices II an association between severe breastfeeding pain (both day 1 and during the first and second week) and an increased likelihood of meeting criteria for major depression using the EDPS scale of 13 or greater at 2 months postpartum was found. Assistance in the hospital to those women with moderate to severe pain was found to have a beneficial effect.

### Engorgement and Plugged Ducts

Engorgement is typically defined as swelling and distension of the breasts and is a common early complaint after delivery. Optimal management of engorgement involves proactive measures focused at prevention. Early and effective breastfeeding can minimize severe engorgement that can subsequently lead to latch difficulties, nipple trauma, and infection. One study found an association with the longer cumulative time spent breastfeeding during the initial 48 hours after delivery and the reduced likelihood of engorgement. Much of the variation of incidence rates reported for engorgement may have to do with differing early breastfeeding practices. Analgesics can be useful to minimize pain, which is an important component of therapy as pain can interfere with the milk let-down reflex. Some degree of engorgement is common in the initial postpartum period. Information from the Infant Feeding Practices Survey in 2008 found that 36.6% of women reported feeling that their breasts were overly full sometime during the first 2 weeks. In women who are experiencing severe engorgement, evaluation of latch and milk transfer by an experienced lactation professional is initial management. If the engorgement is severe enough to prevent proper latch and infant attachment then manual expression, pumping before latching, or reverse pressure softening of the areola are suggested additional measures. A systematic review on this topic found that in minimal study of alternative treatments such as cabbage leaves, oxytocin, cold packs, and breast ultrasound there was no statistically significant evidence that these interventions improved symptoms more rapidly than routine

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care.\textsuperscript{25} One study using acupuncture and another using cold compresses suggested the possibility of symptom improvement.\textsuperscript{26} Most women did experience symptom improvement over time regardless of treatment or routine care. This study did stress that further scientific investigation on management of painful engorgement is needed. A recent study looked at women with severe postpartum engorgement and found that 90\% of these women also reported intense breast engorgement during the luteal phase of their menstrual cycle.\textsuperscript{27} This study found that early postpartum expression of colostrum reduced severe engorgement supporting the findings of other research. Differentiating engorgement from mastitis is important. Although both involve breast tenderness, engorgement typically is diffuse and bilateral with only mild temperature elevation and no erythema. Mastitis is most commonly unilateral, has associated systemic symptoms, segmental breast erythema, and fever.

Plugged ducts represent a localized area of the breast tissue that is failing to adequately drain. They present as a painful, localized lump in the breast that may or may not decrease in size after emptying the breast. Commonly used maneuvers for management include warm compresses applied to the affected area before feeding and breast massage.\textsuperscript{26} It is important to ensure that the lump is resolved after 48 to 72 hours as other potential causes for a persistent tender breast mass should be excluded such as breast abscess, lactating adenoma, or malignancy.

Pregnancy-induced gigantomastia is a rare and distinct entity from engorgement.\textsuperscript{28} It is a diffuse, bilateral progressive process of massive breast enlargement that is likely hormonally mediated and can result in tissue necrosis and subsequent infection. It is speculated to be related to breast tissue hypersensitivity to hormonal influences and may be recurrent in subsequent pregnancies.

\section*{Mastitis and Breast Abscess}
Mastitis is defined as an inflammation of the mammary gland. Reported predisposing factors include things that inhibit adequate drainage of the gland (milk stasis) such as plugged ducts, inadequately managed engorgement, oversupply, pressure against the breast limiting drainage, abrupt changes in feeding frequency, or weaning.\textsuperscript{29,30} Other factors include poor infant attachment and nipple trauma that allow a portal of entry for organisms due to the loss of integrity of the epithelial barrier. Some other reported risk factors have also been suggested such as mastitis with a prior breastfeeding experience and the use of breast pumps.\textsuperscript{31}

Culturing of human milk using molecular technology has increased our understanding of the microbial environment of the breast during lactation. Both skin and enteric-associated organisms have been identified. The role of multiple factors on this microbial ecology is incompletely explored such as the differences related to vaginal verses cesarean birth, skin-to-skin contact, rooming-in verses nursery care, breast pump use, antibiotic exposure, maternal weight, and gestational age. The importance of alternations in the normal flora of this microenvironment or dysbiosis on the potential development of mastitis has yet to be delineated.\textsuperscript{32,33}

Mastitis is often sudden in onset with associated systemic symptoms such as fever, myalgias, fatigue, and flu-like symptoms in addition to breast pain.\textsuperscript{34} Pain is the most commonly noted localized complaint and an associated erythematous portion of the breast is usually visible. When a breastfeeding woman complains of flu-like symptoms, it is worthwhile to explore the possibility of mastitis as the cause of her symptoms. Most commonly the infection is unilateral and often occurs during the early postpartum period. The overall incidence reported in recent literature varies from 9\% to 20\%. Some of this variation is likely
diagnosis dependent. An Australian study analyzing 6-month postpartum phone follow-up data defined mastitis as at least 2 breast symptoms (pain, redness, or lump) in addition to at least 1 of fever or flu-like symptoms. That study found an incidence of approximately 17%. Mastitis was also most likely to occur during the initial 4 weeks postpartum (53% of infections) and was associated with nipple trauma. A study performed in the United States that required provider diagnosis of mastitis at least once during the initial 12 weeks instead found an incidence of 9.5%. In that study 88% were treated with antibiotics and associated risk factors for development of mastitis included history of mastitis with a prior child, nipple cracks and sore nipples, recent use of antifungal nipple cream, and use of a manual pump.

As suggested from the difference of diagnosis mentioned in the above studies, there is a spectrum of severity of illness with mastitis. In some situations early mastitis may successfully be managed by improved breast drainage. However, if there is evidence of more severe infection such as fever > 38.5°C, evidence of systemic illness, or if symptoms fail to resolve after 12 to 24 hours of conservative management then antibiotic therapy is indicated (Table 2). It is important that the affected breast remains well drained for management of infection. Ideally, feedings should be initiated on the affected breast to assure it is well drained. If pain is limiting (possibly due to nipple trauma on the affected breast), feeding can be initiated on the contralateral breast and the infant moved to the affected breast after instigating let-down. Alternatively, if direct feeding is prohibited then pumping or manual expression should occur to empty the affected breast. Pain medications may also be useful to facilitate breast emptying. Frequent breastfeeding and rest are important components of management. Routine laboratory testing is not typically indicated for successful management of mastitis. In some circumstances, evaluation of white cell count may be beneficial to assess illness severity. Research suggests that somatic cell counts and interleukin-8 are markedly elevated in milk during infection, whereas sodium is elevated but to a lesser extent, reflecting inflammatory change in the breast. Recent research exploring the possible use of probiotics (specifically lactobacillus strains isolated from breastmilk) for mastitis treatment has suggested benefit. Additional confirmatory study is needed.

The most commonly found organisms include Streptococcus and Staphylococcus, therefore an antibiotic covering the suspected organisms should be chosen. Typically an antibiotic such as a penicillinase-resistant form of penicillin, for example, dicloxicillin or a cephalosporin is used. There is inconclusive information regarding duration of antibiotic therapy although most experts agree that 10 to 14 days of therapy is warranted. Further research into optimal duration of antibiotics is needed.

Knowing antibiotic resistance patterns in your specific area of practice should help to guide therapy. In addition to treating with antibiotics, other key principals guiding effective treatment include investigation into the predisposing factors. These should be addressed in an attempt to resolve ongoing concerns that could lead to recurrence. Unresolved nipple trauma due to latch problems should be addressed. In addition, it is important that the affected breast remain well drained during treatment to avoid development of breast abscess so continued frequent and effective breastfeeding is encouraged in most circumstances involving a healthy full-term infant. If the mother is unable to directly breastfeed, then either manual expression or pumping should be recommended for milk removal. Pain medications can be used if needed to facilitate breastfeeding or milk
expression. Ibuprofen is effective as a pain medication and the anti-inflammatory effect may be useful in reducing inflammation associated with the infection. Most causative organisms for mastitis come from the infant’s oropharynx or nasal passageway. If however, the infant is premature or the mother is exclusively breast pumping, then other sources for infection should be explored. Consideration of milk culture may be warranted in some circumstances such as recent hospitalization, a premature or otherwise ill or immunocompromised infant, exclusive breast pumping, maternal medication allergy leading to a suboptimal antibiotic treatment.

<table>
<thead>
<tr>
<th>Basic Management Strategy</th>
<th>Specific Considerations</th>
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<tr>
<td>Breast drainage</td>
<td>Assure affected breast is optimally drained, increased frequency of effective feeding. Start feedings on affected breast first unless pain is prohibitive. If pain prohibitive: start on contralateral breast until let-down then move to affected breast. If pain still prohibitive or ineffective feeding, pump or manually express to avoid abscess.</td>
</tr>
<tr>
<td>Pain control</td>
<td>Consider ibuprofen for pain management if needed. Pain may adversely affect let-down reflex. Ibuprofen considered compatible with breastfeeding. Very low milk levels. Relative infant dose 0.1%-0.7%*</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>Early, mild infection may resolve with frequent, effective breast drainage. Antibiotic to cover penicillinase-resistant organisms (typically Staphylococcus sp., Streptococcus sp., <em>E. coli</em>). Typical therapy duration 10-14 days. Common choices: Dicloxicillin, Cephalexin.</td>
</tr>
<tr>
<td>Prevention of recurrence</td>
<td>Investigate for predisposing factors: nipple trauma, poor breast drainage, breast mass. If no e/o above risk factors, explore hygiene, care of pump, etc. as possible source of infection.</td>
</tr>
<tr>
<td>Milk culture</td>
<td>May not be indicated for first episode without other risk factors providing symptomatic improvement in 48 h. Culture for recurrent episodes of mastitis or those that fail to improve after 48 h of antibiotic therapy. Culture for circumstances involving premature or ill infants, those in NICU, infant immunosuppression, etc. Consider culture for exclusively pumping mothers who do not have infant at breast as source of infection. Could pump parts be contaminated? Consider culture when choosing antibiotic that may be less likely to cover suspected organisms due to allergy. Consider culture if high rate of resistance in your community or recent hospitalization (possible MRSA).</td>
</tr>
<tr>
<td>Infant</td>
<td>Milk not usually harmful for term, healthy infant. In cases of premature, ill, or immunocompromised infant—consider culture and discuss with pediatric care provider. In cases with nipple trauma/fissuring: observe latch, feeding, positioning, and evaluate infant’s mouth for tongue tie.</td>
</tr>
<tr>
<td>Imaging</td>
<td>Not typically indicated for mastitis. If antibiotic failure or breast mass, ultrasound to evaluate for breast abscess. Mammography during acute infection may be misleading due to inflammatory changes. Treat infection and pursue mammography after resolving infection if indicated.</td>
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*Information from Hale and Rowe.37*

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choice as initial therapy, recurrent infections, and a community with a high potential for resistant organisms. If a culture is indicated, this can be performed using sterilized pump collection parts (if an electric pump is present in the office setting), or by manual expression of a midstream milk culture using a sterile urine collection cup with care taken not to touch the internal portion of the cup. Cleansing the nipple before culture collection may help to minimize skin contamination. In these circumstances, the purpose of culture is to rule out an organism that would not be covered by the initial antibiotic chosen. Outpatient treatment of mastitis is usually appropriate, more severe cases with evidence of possible sepsis should prompt hospitalization, intravenous antibiotics, and supportive therapy. If hospitalization is indicated, keeping the mother-infant dyad together to facilitate frequent breastfeeding is an important component of therapy unless intensive care unit treatment is needed. In that situation arrangements for adequate pumping or expression are imperative. If the mother with a reddened, inflamed breast is afebrile and lacks typical flu-like symptoms or if antibiotics fail to improve the erythema, consideration of the rare diagnosis of malignancy and investigation for a breast mass should be pursued.

For mothers with recurrent infection, further evaluation for the underlying etiology should be taken. Was the initial mastitis completely treated or did the patient prematurely stop antibiotics as her symptoms improved? Was the initial antibiotic choice inappropriate? Does the patient have continued nipple trauma, oversupply, or engorgement? A breast examination should be performed to rule out an underlying breast mass or abscess, especially when the mastitis recurs at the same site. A breastmilk culture should be performed when treating recurrences or for failure of the initial therapy to resolve symptoms.

The potential role of methicillin-resistant *Staphylococcus aureus* (MRSA) should be considered in cases of significant nipple trauma, mastitis (especially if chronic or recurrent), and breast abscess. The role of nasal screening for MRSA and potential impact of intranasal antibiotics for those with a positive screen in relation to breastfeeding infections is unclear. Providers should consider organism prevalence, resistance patterns, and antibiotic sensitivity in their practice environments. Most MRSA infections can be treated with vancomycin or trimethoprim/sulfamethoxazole but culture with sensitivity should be used to guide therapy and the age and health condition of the infant should also be considered when choosing optimal individual therapy.

The presence of a breast mass may be noted during the breast examination of a patient presenting with a complaint of breast pain. In addition, in some cases of mastitis, pain and swelling may make discrimination of an abscess from cellulitis difficult. In these situations, ultrasound of the breast can assist the clinician in discriminating a fluid filled collection from a solid mass such as a lactating adenoma. Needle aspiration under local anesthesia can help clarify the etiology of a fluid collection (plugged duct or abscess) and any purulent material can be sent for culture. Solid masses may warrant further investigation depending on clinical circumstances and ultrasound characteristics.

Breast abscesses may occur, risk factors include delayed or inadequate treatment of mastitis. Symptoms and clinical findings are similar to mastitis with the additional presence of a breast mass. The incidence of breast abscess noted in an Australian cohort study was 3% of mothers experiencing mastitis and an overall 0.4% of breastfeeding mothers. There are a number of reports indicating that organisms associated with breast abscess are commonly both methicillin-sensitive

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Staphylococcus aureus (MSSA) and community acquired MRSA.\textsuperscript{44–46} This is important to take into consideration when initiating antibiotic therapy for women with puerperal breast abscesses.

Traditional therapy for breast abscesses included surgical incision and drainage with antibiotic therapy. There are now numerous reports of successful management of puerperal breast abscesses using a more conservative approach with serial ultrasound-guided aspiration and antibiotic therapy.\textsuperscript{47,48} This more conservative approach allows continued breastfeeding in most circumstances, improved cosmetic results and can often be done in the outpatient setting. Christensen et al\textsuperscript{47} found a 97% success rate for puerperal abscesses in 89 women with a single aspiration while giving antibiotics. A similar study by Ulitzsch et al\textsuperscript{48} found the mean aspirations needed for those with abscesses <3 cm was 1.8, with a follow-up ultrasound planned 2 to 3 days after the initial aspiration. For those with abscesses >3 cm (ranging from 3 to 10 cm) a catheter was left in place until <4 mL of saline could be flushed that occurred at a mean of 6.4 days.\textsuperscript{48} Some women in this study did require a further aspiration after the catheter was removed. Again all of these women were simultaneously receiving antibiotic therapy. In addition, a study comparing ultrasound drainage in MSSA to MRSA found the MRSA group was more likely to undergo incision and drainage although the result did not reach a statistically significant difference.\textsuperscript{49} This study found an overall higher rate of conversion to incision and drainage for both groups when compared with the Christensen study. Interestingly 38% of the MRSA group never received an antibiotic to which the organism was sensitive and the potential impact of this is unclear. Incision and drainage may be needed for cases which fail to respond to the conservative management above, cases of severe illness, or abscesses that are extremely large.

Both mastitis and breast abscesses may have additional, long-term adverse impacts on breastfeeding success. Some women may notice infant aversion to feeding on the affected breast during infection. Pain should be adequately controlled with medication such as a nonsteroidal anti-inflammatory medication as it can adversely impact the milk ejection reflex. Women may also notice a reduction in supply during the acute infection. This may gradually improve after resolution of infection although some women may note involution of the affected area of the breast that does not recover and downregulation of supply for the duration of breastfeeding for that child. Ultimately, women with breast infections are at risk for premature breastfeeding cessation.

Breastfeeding complications have potential for significant adverse effects on the new mother reaching her breastfeeding goals. Being aware of a structured, logical approach to evaluation of the patient with breastfeeding complaints can assist with moving through the differential to a diagnosis and suggesting appropriate treatment considerations.

References


